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EDITORIALS

ELECTRIC COOKING.

The Society for Electrical Development has announced the appointment of a special committee which is to take up the subject of electric cooking and plan an electric-range campaign which shall be of national scope. The central-station industry is waking up to the fact that electric cooking has great potentialities as a profitable load builder, and the present is regarded as a good time to inaugurate a national campaign. As quoted in an interview on another page, Mr. George A. Hughes even goes so far as to say that this load will eventually exceed the industrial power load of the central stations. While this statement may be credited to the exuberance of an enthusiast and may be regarded by many as an exaggeration, it is nevertheless true that there is an enormous field here for the application of electrical energy which merely awaits the aggressive promotion of those who direct the policies of the central stations of the country.

At the time of the National Electric Light Association's convention in 1912, we published an editorial, an excerpt from which is given below, pointing out that while lighting and industrial power loads are still growing and require the close attention of new-business departments, the next great development of the industry would be in the direction of electric cooking, which has only awaited the intensive sales efforts of the supply companies to yield a large and profitable load. The necessary attention seems about to be given. The Western States have already made a remarkable showing, and the report of the Electric Range Committee of the Northwest Section last year made such an impression that this committee has been appropriated bodily by the National Association, and will make a report at the national convention to be held in Chicago next month. Mr. S. M. Kennedy, of this committee, predicts that 10,000 electric ranges will be sold in 1916 in the Pacific and Intermountain States alone.

As made clear in the paper by Mr. P. L. Miles, in this issue, there are but two conditions necessary to the successful prosecution of a campaign of this kind: the customer must be satisfied, and the business must be profitable to the central station. We have never held any doubt as to the possibilities on either of these points, as a rate can be made which will meet both requirements. To quote from our editorial in the issue of June 22, 1912:

"There is one application of electricity, however, which can be made so general that it should in the future form a large element of the output of every central station in the land, and the next step in central-station development should be the acquisition of this potential load. Electric cooking represents a great possibility for the central station and one which has been entirely too much neglected up to the present time. It is an application that concerns every central station and every customer who is now within reach of the facilities of central-station service. Suitable equipment for this purpose has finally been developed to the point where general satisfaction can be expected from its use. The principal obstacle to its introduction seems to be generally regarded as one of cost, but it is a debatable question whether this is the real obstacle in the way of progress. Electric lighting was firmly established while its cost was still greater than that of other illuminants, and is now being largely used in places where that relation still holds true. It has spread, not on account of its cheapness, but in spite of its cost, and owing entirely to its other advantages. Electric power is sometimes installed with the object of lowering the immediate expense for power. In many other cases the reason has been, rather, its great utility and convenience coupled with considerations which affect matters of cost rather indirectly. Similarly, electric cooking should find its general introduction and firm establishment on other grounds than its cost, and when its advantages are fully appreciated, it will be introduced whether it is cheaper than other methods of preparing food or not. It is not necessary to enumerate its many advantages here, as these have been frequently referred to in these columns. Suffice it to say, that while central stations should make this development as attractive as possible from the standpoint of expense, they should, nevertheless, inaugurate a vigorous campaign to demonstrate to the public those advantages which will outweigh in its eyes even a disadvantage which will exist in many places from the standpoint of cost."

With the experience already obtained, no doubts should remain as to the possibilities of successfully introducing electric cooking. The question is rather one of methods. Central stations are finding that they can safely offer a sufficiently attractive rate, and many companies in the Central States and in the East are making a lower rate than other companies in the West which have already connected considerable loads of this character. There are about 3,000 companies in this country which now offer a cooking rate of not more than five cents per kilowatt-hour. Of these, 835 offer a rate of three cents or less. The latter figure appears to be low enough to get the business even in competition with

cheap fuel. The high diversity-factor of this business—higher than would be anticipated—permits service to be supplied at low cost. The possibility of low rates is not confined to hydroelectric territory, but extends to steam plants outside of the coal fields, such as the Edison Electric Illuminating Company of Boston, which has a three-cent rate.

Two problems confront the industry. One has reference to securing the interest of the consumer; the other is concerned with the method of handling the equipment—of getting it to him. Few cooks or housewives are acquainted with the advantages of electric cooking—they must be educated. This calls for publicity work, demonstrations and personal attention by salesmen. Often trial installations will be necessary, as the uninformed regard the subject as still in the experimental stage. The use of high-class equipment should be encouraged as much as possible, and this will be facilitated by arrangement for deferred payments, or purchase on the instalment plan.

The merchandizing problem shows the industry to be in just as chaotic a condition with respect to this subject as to any other. It is a fact that in many parts of the country development awaits the initiative of the central station, and the latter must do the campaign work if any is to be done. It is then looked to by the consumer, and quite naturally, to supply the equipment and install it. Of course, the latter work can be turned over to contractors where suitable working agreements have been made, but the latter must be familiar with the requirements of this class of work. Whether the manufacturer should deal directly with central station or consumer, or confine his direct transactions to the jobber, is a knotty problem, with no uniform practice established. Some manufacturers make one schedule of prices to all, with quantity discounts. This leaves an opportunity open to the jobber where he can supply a large territory, and purchase in larger quantities than any single operating company, especially if the discounts are figured on annual sales rather than upon individual orders. Other manufacturers make a lower price to jobbers than to central stations, regardless of quantity. A few central stations refuse to do any merchandizing, but see to it that the channels are open for the easy flow of equipment through the jobber and local dealer.

Some central-station managers seem to think it necessary to sell at wholesale prices, or to do the requisite wiring free of charge in order to secure this business. Such ideas are usually based upon misconceptions. Application of salesmanship to the consummation of sales based upon the advantages to be secured, rather than upon cost considerations, will usually make such concessions unnecessary. Sales ability counts for more than price, and when a proposition has intrinsic merit it is a mistake to enlarge upon the latter. Few sales will be lost upon a cost basis if the advantages of electric cooking are sufficiently emphasized, especially if time payments are permitted.

SCIENCE AND ORGANIZATION IN BRITISH INDUSTRIES.

Progress is reported in connection with two large movements that have been set going in England owing to the war. We refer, first, to the scheme for giving national support to scientific and industrial research; and secondly, to the efforts that are being made to bring about a more efficient and unified organization of British engineering industries. The appointment by the British Government of an Advisory Council of Research was referred to in these pages some months ago when we stated the objects for which it was established. The outstanding weakness was the smallness of the fund placed at the council's disposal—$150,000. We are now able to report what has already been accomplished by the initial efforts. The scientific and professional societies were invited to submit applications for aid to continue researches for which the necessary staff and equipment were available and among the purposes for which grants have been or are to be made, are the following: Heating of buried cables and the properties of insulating oils (to the Institution of Electrical Engineers); hardness tests and the properties and composition of alloys (to the Institution of Mechanical Engineers); laboratory glass and optical glass (to the Institute of Chemistry); methods of extracting tin and tungsten (to the Institution of Mining and Metallurgy); corrosion of non-ferrous metals (to the Institute of Metals); tool-steel experiments (to the Manchester Association of Engineers); optical glass (to the National Physical Laboratory). Other proposed grants for similar purposes are under consideration, and one that has been recommended is in aid of an important new research into the manufacture of hard porcelain which is leading up to the establishment of such manufacturing in England. These are all initial steps of the government measures for giving national patronage to the application of science in industrial departments, and in order that the interests of particular branches of industry may be properly dealt with, standing committees of experts in those industries are to be appointed. It is stated that particulars have been collected of the research work of scientific and professional societies, universities, and higher technical schools, with a view to establishing a register of research, and it is not unlikely that the research work of particular firms will be similarly obtained. Action has been taken—action of a more or less preliminary nature, it is true, as not much can be done in this direction during the war—for training an adequate supply of research workers, it being recognized that this will be an important branch of the Advisory Council's work.

The second movement to which we allude is taking the form of a series of meetings of the engineering leaders of a number of important centers in England.

PROGRESS IN LIGHTING EFFICIENCY.

The close relationship between physics, chemistry and illuminating engineering was made apparent by an address last week by President Steinmetz, before the New England Section of the Illuminating Engineering Society. Dr. Steinmetz devoted considerable time in his remarks to the possibilities of further progress in raising the efficiency of lamp filaments and at almost every turn, the importance of co-operative effort between the physicist and the chemist could be seen.

In the last decade there has been a six-fold gain in efficiency, considering merely the incandescent lamp. The specific consumption has decreased from 3 to 0.5 watts per candle. The efficiency of light production is a function of filament temperature, and efforts toward further improvement are sure to be directed along the line of finding a material which will withstand higher degrees of heat than present practice permits. The ideal light, with an efficiency of about 70 candles per watt, seems a tremendous distance away, the present gas-filled lamp yielding but 2 candles per watt. The half-watt gas-filled lamp runs pretty close to the melting point of tungsten. Nevertheless, something may be done along the lines of trying to improve efficiency through reduction of the energy lost by heat conduction and convection, employing, if it can be found, a gas of decreased heat capacity and lower heat conductivity than nitrogen or argon; of trying out the use of higher gas pressures, although the risk of explosion must be considered; or of seeking a material with a higher melting point than tungsten.

What is greatly needed is a substance with a maximum radiation in that portion of the spectrum which is the visible range, say one which could be operated at a temperature of from 5,000 to 5,500 degrees centigrade. The art might then rejoice in a luminous efficiency of 10 to 15 per cent, against the bare 3 per cent available in the gas-filled tungsten unit. Should it be found possible to use some special form of carbon, perhaps carbon deposited from a hydrocarbon vapor, in this work, it might be feasible to obtain an efficiency approximating 10 per cent. Here is a task for organic chemistry which may be expressed somewhat in this fashion: WANTED, a carbon molecule of low dissociation which can be operated at temperatures near the melting point of the element.

It is to the study of selective radiation that physicists must look, in seeking higher efficiencies. It is possible in theory to obtain a substance in which most of the energy is radiated in the visible spectrum. Titanium, calcium and mercury are of considerable interest in this connection. Something may be expected, perhaps, from researches in which superheated vapor is experimented upon with enormously high energy concentrations secured through the use of heavy condenser discharges through the material. Striking changes in the distribution of spectroscopic lines occur under such conditions, and may lead to practical results, perhaps to doubling lamp efficiency in the next ten years if success crowns the efforts of the researchers.

Meanwhile the illuminating engineer should take heart, for the great opportunities of the immediate future are directly concerned with the more efficient application of the lighting agencies available, and while the man in the laboratory works with spectroscope, crucible and bulb, the man who deals with the installation owner can be doing proportionally useful work in making the best possible use of the materials at hand.

MAGNETIC HYSTERESIS IN STRONG FIELDS.

The designer of electrical machinery has for years made use of the empirical relation discovered in 1892 by Dr. C. P. Steinmetz, that the loss of energy in magnetic materials due to the reversal of their magnetization is approximately proportional to a power of the flux-density represented by the number 1.6. In actual machinery the distribution of the magnetic flux is far from uniform and computations based upon average values could not be expected to agree very closely with fact. Even in test specimens, however, experiments seemed to show a wide departure from adherence to the Steinmetz law, especially at high values of the flux-density. The energy loss appeared to go up much more rapidly with increasing flux-density than was indicated by the law. This was especially true of silicon-steel, which has an unusually thick scale upon its surface.

The reason for these apparent deviations from the law are pointed out in an interesting article by Mr. John D. Ball in the current issue of the *Journal of the Franklin Institute*. Sheets of steel covered with a layer of scale constitute a heterogeneous material whose behavior is quite different from what one would find if a pure substance were involved. The scale has different properties from the iron, and both its permeability and hysteresis have different values. The proportion of flux in the two materials consequently varies as the total flux increases. Mr. Ball has shown that this is sufficient to account for the observed results, even if the individual materials conformed closely to the Steinmetz law. It is already known that the law is not exact, but it is much more nearly so than some of the experiments, which were vitiated by the condition pointed out, indicated. The reason the discrepancies are most prominent in strong magnetic fields is that the distribution of flux changes more markedly when the higher flux-densities are reached.

The work of Mr. Ball brings to light one more difficulty with which those making magnetic experiments have to contend. Heterogeneity of material causes difficulty in many places. In the dielectric in a condenser, for instance, it also increases the energy loss. To obtain results which shall be free from question it seems necessary that the experimenter should deal with pure materials.

Happenings in the Industry

Society Plans Electric-Range Campaign—Railway Operation Discussed at New York—Electric-Range Conditions in the West—H. L. Doherty Speaks on Utility Regulation—Electric Vehicle Meeting at Boston—Preparedness Committee Organized—Indiana New Business Men Meet at Kokomo—Miscellaneous News

HOLD IMPORTANT ELECTRIC-RANGE MEETING IN NEW YORK.

Society for Electrical Development to Promote Greater Cooperation and Conduct Comprehensive Campaign.

A special meeting was held April 14, 1916, at the executive offices of the Society for Electrical Development in New York, to consider the undertaking of a special electric range campaign with the industry as well as directing public attention to the advantages of electric cooking. Those attending were representatives of leading electric range manufacturers. The meeting was preliminary to the appointment of a national electric range committee composed of representatives of all electric interests.

It is recognized that the attention of leading interests is being focused upon the desirability of the electric range as a means of building up the domestic load. Several manufacturers are contemplating big campaigns to promote electric range sales and it was reasoned that the Society for Electrical Development would be the best organization to act as a clearing house for the campaign as it did in the "Wire Your Home" movement which has just come to a successful close. It would be the function of the Society to lend support to central stations by giving them specific data on the desirability of range business and to aid them in conducting range campaigns. Sales arguments for range salesmen to use could be standardized as much as possible and then published in book form to be used by the individual salesmen. It was proposed that the Society issue a booklet on how to put on a range campaign.

Considerable stress was laid upon the suggestion that central stations include cost of installation in their range prices. In other words quoting prices with the range installed, thus avoiding selling the range and having then to argue out the cost of installation.

The Society would aid in developing the public demand for ranges by disseminating advertising and publicity matter through its various channels.

It was decided to appoint a special committee to take up in detail the plans for a national electric range campaign. This committee will meet in Chicago May 22, the first day of the convention of the National Electric Light Association.

Lectures on Electrical Subjects to Minnesota Students.

Charles L. Pillsbury, consulting engineer, Minneapolis, Minn., who has recently completed extensive valuation work in Detroit, Washington and other cities, is delivering a course of 18 lectures on "The Valuation of Electrical Properties" for the fifth-year engineering students at the University of Minnesota. R. A. Lundquist, consulting electrical engineer, Minneapolis, Minn., is giving a course of lectures to the fifth-year electrical engineering students on "Transmission Line Construction." Fred Dustin, of the Standard Electric Company of Minneapolis, is giving a course of lectures to the sophomore and junior electrical engineering students on the "Practical Applications of the National Electrical Code."

RAILWAY OPERATION WITH HIGH DIRECT VOLTAGES.

Monthly Meeting of the American Institute of Electrical Engineers at New York City.

At the 320th meeting of the American Institute of Electrical Engineers, held in New York City on the evening of April 14, a paper entitled "High-Voltage Direct-Current Railway Practice," by Clarence Renshaw, was the subject of discussion. In the absence of the author the paper was presented by N. W. Storer.

This paper pointed out the recent increase of operating voltages on direct-current railways, after many years of operation at about 600 volts, which seemed at one time to represent a standardized maximum. The differences in apparatus necessary for the high voltages was first considered, and the probability of still higher voltages pointed out. The author then described the 5,000-volt equipment which has been tried on the Grass Lake line of the Michigan United Traction Company. The car on this line has run over 30,000 miles since October 1, 1915, in all kinds of weather and most of the trouble was not occasioned by the high voltage used. The author considers that it would be desirable to standardize 5,000 volts for direct-current equipment.

The discussion was opened by Frank J. Sprague. He reviewed his past utterances upon the subject and pointed out that railway operation had developed very closely in line with his prophecies. William J. Davis, Jr., of the Southern Pacific Railroad, said that the proper voltage depends upon the tonnage to be hauled and the limitations as to speed. The problem narrows down to the question of the number of locomotives required on a given division and their cost. In the case of the Milwaukee electrification, a change from 3,000 volts to 5,000 volts would materially increase the cost of locomotives, say by 30 to 40 per cent. This would more than offset any saving.

William B. Potter said that in the Milwaukee case the total cost for 3,000 volts or 5,000 volts would be about the same, but it would be differently divided between copper and rolling stock. Since depreciation of the latter is rapid, the higher voltage would be a disadvantage.

Calvert Townley objected to any standardization of voltage at the present time. He attributed a recent tendency for higher voltages on direct-current systems to the competition of the single-phase system. S. I. Oesterreicher spoke of the application of storage batteries on direct-current railway systems. Benjamin F. Wood considered dependability of operation of greater importance than any features of cost. E. V. Pannell discussed operation of motors at different voltages. He considered 3,000 volts the maximum desirable at the present time.

A. H. Armstrong referred to the gradual progress in increasing direct voltages and stated that an experimental test had already been made in Schenectady with apparatus using 6,000 volts. But the higher the voltage the greater the cost and he considered 3,000 volts the most suitable at the present time for railroad electrification. The experimental line using 5,000 volts shows the possibility of higher voltage, but the paper throws no light on the economic advantage of using it.

ELECTRIC-RANGE CONDITIONS IN THE WEST.

Predicted That Western Companies Will Sell 10,000 Ranges During 1916.

By W. R. Putnam.

In the report of the Electric Range Committee of the National Electric Light Association, which will be presented at the convention in Chicago in May, it is predicted by S. M. Kennedy, of the Southern California Edison Company, and a member of the committee, that the companies in the Pacific Coast and Mountain states will sell 10,000 electric ranges during 1916. Many of the companies in this territory have already purchased several carloads of ranges and practically all of the larger companies have energetic campaigns either now in effect or ready to start.

The very marked activity in prospective power business has diverted the attention somewhat from the range business. Also the tendency to stiffen prices on the part of the manufacturers and their announcement of better prices to jobbers than central stations has dampened somewhat the enthusiasm of many of the central-station men.

The high cost of extensions is also preventing taking on some business that would ordinarily come in under standard extension rates. The prosperity of customers, however, will make easier the sale of high-priced ranges. Western central stations report average monthly consumption of residences varying from 15 to 20 kilowatt-hours and they appreciate the importance of actively pushing uses of electric current which will increase the average monthly consumption of these customers to more than 100 kilowatt-hours. If met at least half way by the range manufacturers these companies will secure a large amount of this business in the next few years. No unusual developments have been produced by manufacturers.

There has been considerable discussion by central stations as to the respective merits of inclosed and open-coil units. There is a marked difference in efficiency of each obtained by use of proper kind of utensils. The general feeling is that electrically cooked food results in considerable saving in shrinkage and that this is one of the important selling points.

The Southern California Edison Company in six months' campaign has placed 400 ranges and claims it has just started. Other California companies are showing marked activity, likewise in Oregon, Washington and Utah. The Washington Water Power Company is trying the interesting experiment of training college students for summer range salesmen.

March Activities of Philadelphia Electric Company Section, N. E. L. A.

Henry L. Doherty was the principal speaker at the March meeting of the Philadelphia Electric Company Section of the National Electric Light Association, and discussed the subject of "Utility Regulation." After commenting on the unfortunate results of too much legislative tampering with railroad rates, he said: "We have the same serious problem to meet in the electrical business today. There is everywhere a tendency to regulate the profits of the electric companies and to cut them so short that so far as the immediate future is concerned there is no encouragement to go ahead in the active development of our work. But most of us in the electrical business are optimistic and we are sure the good sense of the people will prevail. We must teach the public that the electrical industry is entitled to the same degree of profit that would be realized in other lines of business which accept the same risk." Mr. Doherty, on reverting to the subject of the education of the public to the policies of electric lighting companies, took occasion to speak of the good work which the men affiliated with company sections could do, if organized to properly train public opinion along these lines. There were over 500 present at the meeting.

The meeting of the meter department branch was addressed by P. H. Bartlett, superintendent of the meter and installation departments of the Philadelphia Electric Company, who sketched the growth of these departments and indicated the possibilities for future expansion.

The meeting of the engineering department branch was addressed by E. A. Turner, who gave a talk on the work of the aerial line department. He had a large collection of slides showing appliances and tools, and pointed out the standard practice of the company in overhead construction work.

Five ten-minute papers were presented at the meeting of the commercial branch, covering the following subjects: "Contract Routine With Reference to Placing of Meters," by P. C. Glassey; "Contract Routine With Reference to Installing Service," by B. A. Looby; "Arguments Used in Explaining the Reason for a Minimum," by I. H. Mulford; "The Best Answer to the Question 'Why Should I Make a Deposit?'" by J. Mervish; "Methods of Handling Service Complaints from a Commercial Viewpoint," by F. P. Smith.

The April meeting of the Section will be addressed by Edward F. Trefz, field secretary of the United States Chamber of Commerce, on "Judgment, Enthusiasm, Obedience and Loyalty."

Comparative Costs of Electric and Gasoline Vehicles Given at Boston Meeting.

The final meeting of the New England Section, Electric Vehicle Association of America, which has recently been merged with the National Electric Light Association, was held at the Hotel Thorndike, Boston, April 11. E. S. Mansfield, of the Boston Edison Company, presided and announced plans for the May convention in Chicago, where it is expected electric vehicles will be an important subject for discussion.

George H. Hudson, district manager for the General Vehicle Company, spoke on the comparative costs of gasoline and electric vehicles. He pointed out that the electric is the logical transportation agency in congested city streets. Important advantages are the greater readiness with which drivers learn to operate the electric truck, its longer life and, hence, lower depreciation cost, and the greater mileage obtainable from tires.

Present gasoline prices are another powerful inducement to adopt the electric rather than the gas car. Current for charging costs about the same as for gasoline at 12 cents per gallon. One gallon of gasoline, operating a given truck three miles, gives a fuel cost of 8.3 cents, with gasoline at the present price of 25 cents. Under the co-operative charging rate furnished by the Boston Edison Company, the cost would be five cents a mile. Garaging charges are much less for the electric than for gas cars, and drivers' wages are $15 to $16 per week, while chauffeurs of gasoline trucks receive at least $18, and up to $25.

Mr. Hudson gave the total yearly operating cost for 5-ton trucks running 30 miles per day, as follows: fixed charges, electric, $691; gasoline, $1,264 (7.6 and 14 cents per mile, respectively); operating cost, electric, $2,772; gasoline, $2,824, a difference in totals of $625 in favor of the electric. Daily costs would be $11.54 and $13.62, respectively, and costs per mile 38.4 and 45 cents, respectively. This is on the basis of electricity at the comparatively high rate of five cents per kilowatt-hour, and gasoline at 25 cents per gallon.

D. C. Jackson, professor in the Massachusetts Institute of Technology, described the tests made by a department of the Institute which clearly proved that the electric is supreme in the field of short-haul freight handling. He pointed out the

relative merits of various types of road surface, saying that hard asphalt, kept in good condition, is the most favorable for the operation of motor vehicles, with wood block, water-bound macadam, vitrified brick, cement-bound granite block, tar macadam, gravel or cinder, and cobblestone next in order. Granite block filled with sand, while excellent for horse-drawn vehicles because of the purchase given to shoes, is at great disadvantage for motors, offering 2.5 times the resistance of good asphalt or wood-block road. The almost universal use of motor vehicles in London, Paris and Berlin is in large part due to the smooth road surfaces in those cities.

New York State Industrial Preparedness Committee Organizes.

The Industrial Preparedness Committee, Naval Consulting Board of the United States, New York State Section, appointed by Secretary of the Navy Daniels, met at a luncheon given April 14 in New York City by J. G. White, president of J. G. White & Company, and organized for active operation.

The Industrial Preparedness Committee of the Naval Consulting Board, of which H. E. Coffin is chairman, has undertaken an exhaustive census of the industries in the United States, the object of which is to determine what way and to what extent the various manufacturing plants in the United States are equipped to be of service to the government in time of war. This census is to have the co-operation of each of the national engineering societies, and each Society has a representative on the various state boards.

At the organization meeting J. G. White, who is the representative from the American Society of Civil Engineers, was elected chairman of the New York state board. The remaining members of the board are as follows: William McClellan, American Institute of Electrical Engineers; Charles F. Rand, American Institute of Mining Engineers; W. H. Marshall, American Society of Mechanical Engineers, and Dr. T. B. Wagner, American Chemical Society.

Right of Electric Company to Build Transmission Line Upheld.

The State Supreme Court of Pennsylvania has rendered an important decision denying the right of property owners at Ellwood City to restrain the Harmony Electric Company from building a transmission line through the municipality, and sustaining a ruling of a lower court.

In this action, the property owners filed bills in equity to prohibit the company from building its proposed line along an alley fronting on their property on Chestnut Way, holding that since the company had agreed with the city not to furnish electric energy within its limits, it therefore had no right to erect the transmission line merely to carry power through the municipality. The company maintained that in its agreement with the city for permission to construct the line, the consent was qualified by the following clause in the contract:

"This consent is intended only for the purpose of permitting the company to carry its electric current through the borough to a substation of the Pittsburgh, Harmony, Butler & New Castle Railway at Koppel, Beaver County, and for no other purpose; therefore, the said company shall not make any connection with the said high-tension wire or wires within the said borough, or permit others to do so."

The lower court in its decision held that under the right given to the company in its charter to supply electric energy, the right to manufacture or generate it was included, and that in the case of a consolidated company, such as the present one, it was not necessary that the electric energy should be generated or manufactured in the district where it was to be used, and that by necessary implication the right existed (with municipal consent) to carry it to the district where it was to be used. The court also pointed out that the question whether the company was fulfilling its duties under its charter to the public in the district of Ellwood City, could not properly be raised in this case.

In affirming this decision, the Supreme Court says:

It does not appear that the company has refused to furnish electric light or power to any one in the Ellwood City district, and there is no evidence to show that the company has refused to perform any of the obligations imposed upon it under its charter. The company has shown its charter authorizing it to maintain electric transmission lines; it has shown permission from the borough to construct a line along a certain street, and the approval of the proposed construction by the Public Service Commission. It has not been shown that it has refused to furnish electricity to any applicant in Ellwood City. The bills will be dismissed and the ruling of the lower court sustained though it appears that the company has agreed with the borough, in a contract of questionable validity, not to furnish electric current within its corporate limits.

Hydroelectric Plant for the Production of Nitrates from the Air.

According to recent reports received from Spokane, Wash., the 200,000-horsepower project in "Z" Canyon, near Metaline Falls, upon which Wilbur S. Yearsley and associates have been working for three or four years, may become the site of a plant for the production of nitrates from the air, to be used in the manufacture of war munitions for the United States government. The plant is to cost approximately $20,000,000 and the project is considered one of the greatest water power projects in the United States, being held by the International Power Company. The project is located on the Pend Oreille River, 90 miles north of Spokane.

Credence is given to this report by the fact that Pierre S. du Pont, president of the E. I. du Pont De Nemours Powder Company, in a communication to the Secretary of War, stated his company would construct a plant of this nature for the government if the present water-power laws are amended to provide for the granting of 50-year water site leases. Mr. du Pont stated that in consideration for the government's aid, his company was willing to spend $20,000,000 on a hydroelectric and electrochemical nitric acid plant for the government and turn over to the government all or any part of the product of the plant at a price to be fixed by the Secretary of War. Hugh L. Cooper, one of the foremost construction engineers in the country, who has taken charge of the development work for Yearsley and associates, at "Z" Canyon, is also acting as consulting engineer for the du Pont De Nemours Powder Company.

Society for Electrical Development to Hold Annual Meeting in May.

The fourth annual meeting of the Society for Electrical Development, Inc., will be held May 9 at its executive offices in the United Engineering Societies Building, New York City. The board of directors for the ensuing year will be elected. An amendment to its by-laws will also be voted upon. General Manager Wakeman will read his annual report of the Society's activities and also outline the extensive plans for "America's Electrical Week" campaign this fall.

It is highly encouraging to the supporters of the Society to find that the "Electrical Prosperity Week" campaign, the "Wire-Your-Home Month" campaign, and its regular activities have yielded a large number of new members. The Society has some very big plans under way for similar sales movements which have not been announced.

INDIANA NEW-BUSINESS MANAGERS DISCUSS ELECTRIC COOKING.

Enthusiastic Meeting of Indiana Association at Kokomo.

That electric cooking as means of increasing central-station income with a comparatively low additional investment is one of the vital questions confronting the central-station industry today was brought out by the discussion at a meeting of the New-Business Committee of the Indiana Electric Light Association at Kokomo, Ind., on April 19.

A paper presented by Pierre L. Miles, of the Globe Stove & Range Company, which is abstracted on other pages of this issue, pointed out the salient features of the business and a spirited discussion followed. This was lead by Norman A. Perry, of Indianapolis; M. V. Stagg, of Ft. Wayne, and H. E. Gant, of Marion. It was brought out that one of the features to be considered in striving for cooking business is that it will, perhaps, make necessary the rebuilding of secondary lines. It was also pointed out that one objection to electric cooking is that it is slower than gas. The co-operation of range manufacturers looking to the placing of electric ranges on trial was advocated.

R. A. McGregor, of Indianapolis, pointed out that the greatest field was among the middle classes, because families employing servants gave less consideration to efficiency in the kitchen than where cooking was done by the housewives. In the early stages of the development of this business it is frequently desirable to install individual transformers for range customers, but as the load increases customers can be grouped.

E. J. Condon, of Angola, called attention to the fact that conditions of the Middle West are not comparable to those in other territories, particularly on the Pacific Coast and in the East. Profits at present are so low that material reductions are prohibitive.

The meeting was the first of its kind held by the New-Business Committee of this Association and there was an attendance of 80 at the meeting. E. J. Condon, president of the Association, welcomed the delegates in an address in which he called attention to present-day central-station problems. O. M. Booher, chairman of the committee, presided.

Following the discussion on electric cooking, luncheon was held at the Courtland Hotel, immediately following which Elwood Haynes delivered an address on "Tungsten and Its Application to the Electrical Industry."

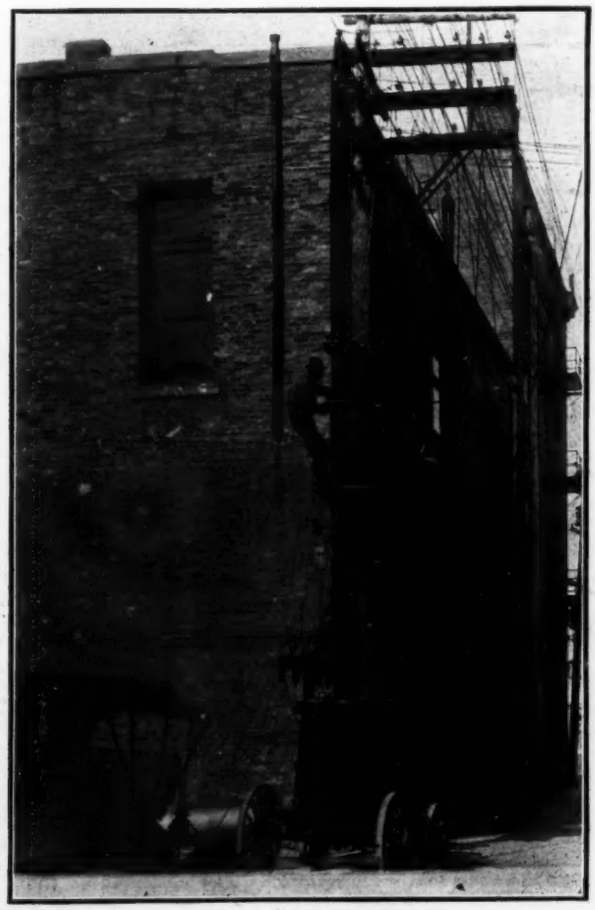
At the afternoon session a paper was presented entitled "Features and Figures on Rural Extensions," by P. H. Palmer, of the Indiana Railways & Light Company, Kokomo. This paper was discussed by E. I. Meyers, of Fort Wayne, G. K. Wilson, of Muncie, and John Kester, of Noblesville. There was also a paper by A. C. Riggs, of the Merchants Heat & Light Company, Indianapolis, entitled "Forecast and Co-operation." This paper was discussed by G. O. Nicolai, of Terre Haute, and Theodore Donahoe, of Lafayette.

Keeping Service On by Use of Portable Transformers.

The accompanying illustrations show the method used in Waco, Texas, a city of some 40,000 population, of changing circuits from 2,300 to 4,000 volts, and from two phase to three phase, without interfering with the service in this town.

In making the complete change-over, there was but one slight interruption and this was of no consequence.

The bank of transformers shown on the wagon was moved from place to place and used while the permanent bank was being erected.



Two Views Showing Method Used by Texas Power & Light Company in Changing Service Without Interrupting Supply. Portable Transformers Are Mounted on Truck.

Electrical Men on Industrial Preparedness Committee.

The appointees of the American Institute of Electrical Engineers of State Directors of the organization for industrial preparedness, who become associate members of the Naval Consulting Board have been announced for the several states as follows:

Alabama, Theodore Swann, Alabama Power Company, Birmingham.
Arizona, David W. Jones, Arizona Copper Company, Clifton.
Arkansas, W. N. Gladson, University of Arkansas, Fayetteville.
California, A. H. Babcock, Southern Pacific Company, San Francisco.
Colorado, W. S. Aldrich, Colorado Agricultural College, Fort Collins.
Connecticut, Samuel Ferguson, Hartford Electric Light Company, Hartford.
Delaware, W. S. Spruance, Jr., E. I. Dupont de Nemours & Company, Wilmington.
District of Columbia, John H. Finney, Aluminum Company of America, Washington.
Florida, C. S. Hammatt, Consolidated Engineering Company, Jacksonville.
Georgia. A. M. Schoen, Underwriters' Association, Atlanta.
Idaho, O. G. F. Markhus, Electric Investment Company, Boise.
Illinois, P. Junkersfeld, Commonwealth Edison Company, Chicago.
Indiana, F. S. Hunting, Fort Wayne Works of General Electric Company, Fort Wayne.
Iowa, Norman T. Wilcox, Mississippi River Power Company, Keokuk.
Kansas, George C. Shaad, University of Kansas, Lawrence.
Kentucky, Carl P. Nachod, Nachod Signal Company, Louisville.
Louisiana, M. S. Sloan, New Orleans Railway & Light Company, New Orleans.
Maine, W. S. Wyman, Central Maine Power Company, Augusta.
Maryland, J. B. Whitehead, Johns Hopkins University, Baltimore.
Massachusetts, C. L. Edgar, Edison Electric Illuminating Company, Boston.
Michigan, H. H. Crowell, Michigan Railway Company, Grand Rapids.
Minnesota, W. N. Ryerson, Great Northern Power Company, Duluth.
Mississippi, J. T. Robertson, Mississippi Inspection and Advisory Rating Company, Vicksburg.
Missouri, C. S. Ruffner, Mississippi River Power Distributing Company, St. Louis.
Montana, M. H. Gerry, Jr., Engineering Corporation, Helena.
Nebraska, H. A. Holdrege, Omaha Electric Light & Power Company, Omaha.
Nevada, W. K. Freudenberger, Public Service Commission, Carson City.
New Hampshire, J. B. Smith, Manchester Traction, Light & Power Company, Manchester.
New Jersey, Farley Osgood, Public Service Electric Company, Newark.
New Mexico, J. L. Brenneman, University of New Mexico, Albuquerque.
New York, William McClellan, New York City.
North Carolina, C. I. Burkholder, Southern Power Company, Charlotte.
North Dakota, John F. Stevens, University of North Dakota, University.
Ohio, Samuel G. McMeen, Columbus Railway, Light & Power Company, Columbus.
Oklahoma, H. V. Bozell, University of Oklahoma, Norman.
Oregon, O. B. Coldwell, Portland Railway, Light & Power Company, Portland.
Pennsylvania, Paul Spencer, United Gas Improvement Company, Philadelphia.
Rhode Island, L. W. Downes, D. & W. Fuse Company, Providence.
South Carolina, W. M. Riggs, Clemson Agricultural College, Clemson.
South Dakota, B. B. Brackett, South Dakota State College, Brookings.
Texas, Fred A. Jones, Dallas.
Utah, Markham Cheever, Utah Power & Light Company, Salt Lake City.
Vermont, B. T. Burt, Rutland Railway, Light & Power Company, Rutland.
Virginia, Walter S. Rodman, University of Virginia, University.
Washington, John Harrisberger, Puget Sound Traction, Light & Power Company, Seattle.
West Virginia, H. S. Sands, H. S. Sands Electric & Manufacturing Company, Wheeling.
Wisconsin, A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee.
Wyoming, P. N. Nunn, Wyoming Electric Company, Casper.

Visits to Local Industries During Convention Week.

One of the sub-committees of the general convention committee which is making elaborate preparations for the annual convention of the National Electric Light Association to be held at the Auditorium and Congress Hotels on May 22-26 is the Local Industries Committee.

This committee is arranging trips for convention visitors to many points of electrical and technical interest in Chicago at the time of the convention. The chairman of the committee is W. L. Abbott, of the Commonwealth Edison Company, and the other members are H. L. Grant, Western Electric Company; W. T. Dean, General Electric Company; T. J. McGill, Westinghouse Electric & Manufacturing Company; S. M. Bushnell, Illinois Maintenance Company; J. G. Learned, Public Service Company of Northern Illinois, and Frederick Von Schlegel, Allis-Chalmers Manufacturing Company.

This committee has held several meetings and is preparing an attractive list of excursions that visitors to the convention may have an opportunity of inspecting the many interesting technical concerns in and near the city.

Executive Committee of Industrial Electric-Heating Bureau, N. E. L. A., Meets.

The first meeting of the executive committee of the new Industrial Electric-Heating Bureau of the Commercial Section of the National Electric Light Association was held in Detroit, Mich., April 11. Plans for the work of the bureau were formulated, an outline plan of the work for the coming year being made. All the various appliances used in heating by electricity were divided into classes, with the object of having sub-committees delegated to take up the work under the different classifications, which are: furnaces for steel and ferro alloys; furnaces for other alloys; enameling and paint-drying ovens; heat-treatment and tempering furnaces; welding apparatus, and small industrial applications such as glue pots, soldering irons, embossing presses, tailors' irons, etc.

The executive committee is composed of C. I. Hirshfeld, Detroit, Mich., chairman; G. H. Jones, Chicago, Ill., secretary; A. K. Young, Toledo, O.; H. O. Loebell, New York City, and M. E. Turner, Cleveland, O.

Flood Lighting in Reconstruction of Burned City.

As soon as the contractors started building operations in the City of Paris, Texas, recently destroyed almost in its entirety by a disastrous fire, the Texas Power & Light Company got on the job and with flood lights installed at

Reconstructing a City by Aid of Flood Lighting.

convenient points enabled the contractors to work at night and thus hasten the reconstruction work.

The two illustrations show a temporary building that was hastily erected on the city square. One of the views shows a night picture of this same building as illuminated with flood lights.

Miscellaneous NEWS NOTES

What an Electric Sign Is.—"An Electric Starter on Your Business" is what the Rutland (Vt.) Railway, Light & Power Company aptly calls an electric sign. The company is pushing this line of business rather strongly at the present time.

Texas Electrical Contractors to Meet.—The annual meeting of the Electric Contractors' Association of Texas will be held in Galveston, May 17 and 18, which will be coincident with the meeting of the Southwestern Electrical and Gas Association. Charles W. Graham, of Dallas, is secretary-treasurer of the contractors' association.

Utility Companies Must Number Poles.—The Board of Commissioners of Knoxville, Tenn., has passed an ordinance requiring all the public utility companies to number all line poles and to furnish the city with maps showing their location. It is claimed that this will aid in the work of eliminating unnecessary poles.

Flood Lighting for Arkansas State Capitol.—The Arkansas State Capitol is now illuminated by flood lighting, the installation being made by the Little Rock Railway & Light Company. It is said to be the first state capitol in the country to be lighted in this manner. The entire exterior of the building is covered with light from 30 500-kilowatt units.

Duluth Revising Its Electrical Ordinances.—The building code of the city of Duluth, Minn., is being revised and an ordinance pertaining to the installation and maintenance of electrical work will be included. A committee, of which A. W. Lindgren, manager of the Northern Electrical Company, is chairman, is engaged in the work of drafting the new ordinance.

Electric Flags at Gas Meeting.—Electric "Old Glorys" were a striking feature of the banquet of the Pennsylvania Gas Association, held on April 12, during their annual convention at Easton, Pa. The manager of the local company, W. D. Ray, arranged three electric flags in the room, and as the diners rose to sing "America" the current was switched on. The spirit of the occasion was one of interest and enthusiasm following this outburst. If the flags had been burning at the beginning they probably would have received little attention.

Louisville Rotarians Hold Magnetic Meeting.—The Rotary Club of Louisville, Ky., called their session of April 13 a magnetic meeting, the program being turned over to the electrical members of the organization. The meeting was in charge of Robert Montgomery, of the Louisville Gas & Electric Company. Speakers on the program included H. B. Anderson, Frank H. Miller, Louis K. Webb, Fred Burdorf, W. C. Daviet, James Clark, Jr., F. A. Clegg, H. V. Bomar, A. R. Fugina and J. F. Snarenberger. As each man entered the dining room his card was rung up on a fare register and he received a slight electric shock from a device in the floor. The room was decorated with safety-first signs and many floor and table lamps, and a large spotlight brought the speakers into prominence.

Project for Tidal Generating Plant Launched at Boston.—The Universal Tide Power Company, with $10,000,000 capital, has been organized under Massachusetts laws to operate and develop the Knowlton tide motor, under United States patent No. 830,543. Offices have been opened at 7 Water Street, Boston, where a model of the motor is exhibited. A feature claimed is its ability to perform its work continuously, with uninterrupted operation of a power transmission shaft in one direction. By means of three float compartments, which are supplied from a reservoir, the floats alternately provide continuous power. It is said that the company is considering installing an electric generating plant near Rockland, Me., to supply energy to a railway line. Those behind the undertaking are John A. Knobs, president, and John A. Knowlton, treasurer.

Dr. Steinmetz Addresses Boston Section A. S. I. E.—Dr. Charles P. Steinmetz, president of the American Society of Illuminating Engineers, addressed the Boston Section at the Engineers' Club April 13. He outlined the progress in electric lighting, and then described in minute technical detail present developments and future possibilities in the field of both street lighting and interior illumination.

Jovian Initiation at Sandusky.—Fourteen men identified with the electrical industry in Sandusky, O., were initiated into the Jovian Order, April 11, by the degree team from Cleveland, composed of B. Peris, E. H. Martindale, M. H. Moffett, M. S. Cotavish, J. M. Bateman, J. A. Wahlgren and W. C. Kunzman. E. A. Bechstein was appointed First Tribune at Sandusky and will have charge of the organization of the chapter that probably will be formed there. The installation was attended by a number of Jovians from Akron, Toledo and New York, as well as from Cleveland.

Colored Photography Discussed Before Los Angeles Jovian League.—A pleasing and instructive diversion was provided at the meeting on April 12, by S. J. Keese, chairman of the day, in a lecture on "Colored Photography," which was explained and illustrated on the screen by photographic slides taken in their natural colors. Herbert J. Goudge, the principal speaker of the day, discussed the theory of the spectrum and explained with the aid of lantern slides, the process of decomposing light with the spectroscope. He was followed by T. C. Low, also an authority on spectroscopy, who explained the intricate details of color photography, and illustrated his talk with photographic slides of scenery and flowers. Dain L. Tasker and S. J. Keese, also exhibited color photographs made by themselves.

New Electrically Operated Clock in Boston.—Boston's new Customhouse Tower clock, one of the largest all-electrical installations in the country, was put in operation April 8. The dials are 21 feet in diameter, the hands being 13 feet 6 inches and 10 feet 6 inches long. Control is from a master clock in the custodian's room 374 feet below the clock dials. The master clock is fitted with a contact to close the circuit every minute. It also has a pilot clock to coincide with the four pairs of hands on the tower, and a device for resetting the hands if required. In this room is also a switch for controlling the lamps which ligh the dial and hands. Back of the dials, on the twenty-third floor, are motor-driven secondary clock works, fitted with magnets which are operated exactly on the minute by the master clock. The armature, drawn forward, throws in the motor circuit, and the motor runs 10 seconds, moving the hand across the space to indicate one minute's time.

New York Contractor's License Suspended.—The license of Joseph Boritz, an electrical contractor, of 121 Columbia Street, Manhattan, N. Y., was suspended for 30 days by Commissioner Williams, of the Department of Water Supply, Gas and Electricity, New York City, for repeated failure to solder and tape splices and for other serious electrical defects appearing on work recently performed by him. This is the first suspension under the Electrical Code, enacted in July, 1915, by the Board of Aldermen. The code not only contains detailed provisions in reference to the installation of wires and appliances for electric light, heat and power calculated to reduce the number of accidents to property and persons through fire and to persons through electric burns or shocks, but it also wisely provides the commissioner with a means of control through requiring electrical contractors to obtain licenses from the department and giving the commissioner power to suspend or revoke such licenses when sufficient cause has been given.

The Future of Electric Cooking Assured

George A. Hughes Sees Time When Range Load Will Exceed Motor Business and Double Revenue of Central-Station Companies

"The time is not far removed when the electric range load will exceed that of motors and double the present income of central stations, with a comparatively small additional investment." This optimistic prediction of George A. Hughes, president of the Hughes Electric Heating Company, Chicago, and a pioneer in electric range manufacture, was made to a representative of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN upon the return of Mr. Hughes from a meeting called by the Society for Electrical Development in New York recently to discuss ways and means to bring the merits of electric cooking before the ultimate consumer.

As might be expected, Mr. Hughes is firmly convinced that the electric range has been tried and proven and is here to stay. "Progress of electric cooking is to a very marked degree similar to that of the development of power business, the same trials and tribulations being encountered as a few years ago when a few manufacturers of electric motors endeavored to interest central stations in securing business from factories and other industrial establishments. It was thought that considerable difficulty would be encountered in justifying to customers using electricity for lighting purposes, a lower rate for energy to operate electric motors, especially in those instances where power was used during lighting hours."

Mr. Hughes stated that the same conditions, to a somewhat less degree, were first found to exist when trying to interest central stations in the possibilities of electric cooking. This was especially true in those states having commission regulation, it being thought by many central-station managers that it would be difficult to justify a low cooking rate where comparatively high lighting and power rates were in existence. "As is true of motor business, the high load-factor and diversity-factor of electric cooking has made it entirely feasible for central stations to offer a low rate for this class of business and practically all public service commissions have recognized and approved of special cooking rates. The western states, particularly those served by large hydroelectric projects, have been the first to recognize the importance of this field and make a rate sufficiently low to attract the business, but it has been demonstrated by an analysis of conditions in practically every state, that in many communities served by steam generating plants a lower rate is in effect than in some of the western communities served by cheap hydroelectric energy. It is just as possible for an efficient modern steam plant to make a low rate for cooking as in the districts served by water powers.

"As to diversity-factor, it has been found in a number of instances that this runs as high as 20 in an entire community and in one building, the Tudor Arms Apartments, of Portland, Ore., where 45 ranges are installed, the diversity-factor is never less than 10. It is my contention that in extensive installations such as in Billings, Mont., where there is over 3,500 kilowatts of electric-range load connected, the diversity-factor approximates 30.

"It is interesting to note that only six years ago the central station at Billings, Mont., was the only company of record offering a rate as low as three cents exclusively for electric cooking. Today there are upwards of 3,000 communities in which a special low cooking rate is in existence and many others have signified their intention of offering a special rate for the summer campaign."

Mr. Hughes believes that there is nothing that can stop the march of progress of electric cooking. Very frequently there has been a tendency on the part of competing gas companies and in some few instances combination gas and electric companies to hinder the progress locally, in the case of the latter to at least refrain from taking any active part in promoting the business. This hindrance or inactivity has no terrors for the electric cooking enthusiasts. "Electric cooking is here: it is a better method than any at present known for the preparation of food," says Mr. Hughes. "That one fact is in itself of sufficient importance to absolutely insure the future of the business. The opposition which we sometimes meet can be compared to the opposition of the Indians in the northwest to prevent the passage of trains over the Northern Pacific Railroad when it was first built. Several redskins stood on either side of the track and held a buckskin lariat between them with the intention of stopping the first train as it came on its way."

Referring to the arguments sometimes advanced that electric cooking cannot possibly be promoted in communities where a plentiful supply of gas is available, Mr. Hughes says, "Electric ranges are actually being sold in communities where natural gas at 25 cents per 1,000 cubic feet is available. This should not be taken to mean that electricity for cooking is cheaper than 25-cent gas, but the superior results obtained, the great convenience and other merits of the electric method are so well appreciated that even at a higher cost electric cooking is demanded. As a matter of fact, it has been proven in innumerable installations that electricity at three cents per kilowatt-hour is about equal to gas at $1.00. However, it should be emphasized that electricity is not being sold on a price basis, but on a quality basis.

"The public has been educated to use electric light not because it is the cheapest, but because it is the best. The same applies to electric cooking and with equally intelligent and comprehensive activity on the part of manufacturers and central stations to educate the public, the same situation in regard to the use of electricity for cooking will come to pass.

"One often hears of the high cost of the electric range and that this feature will retard its universal adoption. The cost of electric ranges is higher than that of gas and undoubtedly always will be because of their much better construction, their higher efficiency and the great attention to details which is given by every reputable manufacturer. However, it should be known that the efficiency of the electric range is 85 per cent as compared to an efficiency of 15 per cent for the gas range. Of course, with greater production, the cost of electric ranges will be decreased."

In regard to the methods adopted by various central stations to interest the prospect in electric ranges, perhaps the most satisfactory is that of placing them on trial. "The manufacturer is willing and ready to stand back of his product and the central station should have no hesitancy in agreeing to permit the customer to determine by experience whether or not the electric range meets his expectations. Of course, it is only proper that the utility company be reimbursed, at least to some extent, for the expense incurred for wiring and installing the range, but this feature rests entirely with the company. A very satisfactory policy is that adopted by the Illinois Northern Utilities Company which permits a customer to use a Hughes range on 15 days' trial. The customer reserves the right to have the range removed at the expiration of this period, the only expense being for the amount of energy consumed, plus a charge of $4.00 for the cost of wiring and connecting the range. This charge of $4.00 does not cover the entire cost of wiring, but leaves the impression with the customer that should he desire the range removed he has paid the necessary expenses and is therefore under no obligation." Mr. Hughes also stated that a practice which has been very successful is that of permitting the customer

to use the range the first month without any cost for energy, it being found that the first month's bill is always abnormally high due to the inexperience of the user and to frequent demonstrations which are made to visitors. Often a customer is so impressed by the first bill that he desires the range removed immediately and this practice overcomes this important objection. However, it is advisable to inform the customer that the amount of energy used was excessive, if this is so, and he should be instructed how to use the range so as to reduce the consumption.

"In a few isolated cases there has been some complaint regarding the discount allowed by manufacturers to jobbers, central stations, etc.," said Mr. Hughes. "This matter of discounts is entirely a quantity proposition and does not take into consideration whether the purchaser is a central-station company, jobber or dealer. Neither the central station nor jobber is entitled to any preference in this regard."

Mr. Hughes referred to the expensive wiring necessary for an electric range installation and stated that the practice in many communities, where considerable progress had been made in developing this business, was to either sell the range at list price and do the necessary wiring without cost to the customer, or sell the ranges at cost and require the customer to pay for his own wiring installation. "With the proper co-operation on the part of the various interests vitally concerned in the development of this business, there is no question but that electric cooking will very rapidly come into its own and prove the solution to the ever present question of how to increase the revenue from residence customers."

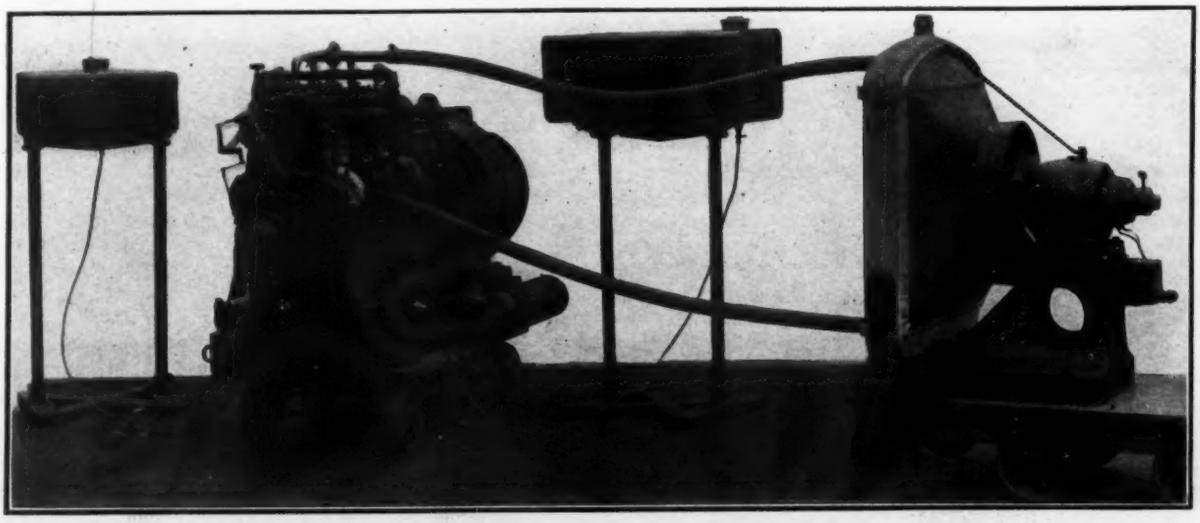
A British Military Field Workshop Electricity Generating Plant.

The European war has been responsible for the introduction for military purposes of many new examples of electrical engineering skill, many of which are not likely to have the light of publicity turned upon them until the great struggle of nations is over. On both sides of the fighting line, not a great distance from the trenches, extensive establishments have sprung up for engineering repair work of all kinds where tools are not only lighted by electricity, but in which the machine tools are electrically driven. Herewith is shown an illustration of a special generating set which has been designed and constructed for the British military authorities by the Austion Motor Company, Ltd., for supplying energy for lighting and power purposes in field work-shops.

The plant comprises one of the company's standard type of automobile engines, with four separate cylinders, coupled direct to an 18-kilowatt generator. The engine, which is provided with a governor, in order to secure a constant speed, is fitted with magneto ignition and is adapted to work with either gasoline or kerosene; the former is used on starting up and kerosene when the engine becomes warm, the heat of the exhaust manifold being utilized, by means of a "muff" in conjunction with the gas admission pipe, to assist in the vaporization of the heavy oil. An interesting feature of the plant is the method of cooling the cylinders; instead of the large tank of water usually employed for this purpose in stationary engines, an ordinary automobile-type radiator is employed, this being mounted on a separate bed-plate and provided with an inclosed fan, driven by a small electric motor, in order to maintain a strong current of cool air through the radiator; flexible armored hose is used to conduct the water to and from the engine, the circulation being maintained by a small pump. As will be seen, the set practically comprises four units—the engine and generator, the radiator and fan, and the kerosene and gasoline tanks, the latter being mounted on stands in order to give the necessary head for gravity flow of the liquid fuel to the carburetor, an arrangement which enables the plant to be quickly erected in any desired position and equally rapidly dismantled.

Hearing on Valuation of Telephone Properties in State of Washington Finished.

The Washington State Public Service Commission on March 20, finished its hearing relative to the physical valuation of the properties in the state of Washington of the Pacific Telephone & Telegraph Company, which maintains head offices in San Francisco. The hearing was begun in Tacoma, January 17. Findings on the valuation are not anticipated for several months, due, to the mass of data involved. Chairman Reynolds announces the commission will begin its rate hearing on May 21, at Olympia, and at this time the commission will consider the question of segregation of properties, used for local and toll service in the large cities of the State. The commission will also consider the question of discrimination, and of switching rates on farmer lines. The Pacific Telephone & Telegraph Company contends for a valuation based on the cost of reproduction of approximately $19,000,000. The figures of the commission are estimated at a total of about $16,000,000. It is stated the commission's figures are deceptive, inasmuch as they do not include such items as development costs, taxes, interest during construction, and other items which the company includes in its unit costs.



A Portable Electric Generating Station Used by the British Forces in the Field.

Developing the Electric Range Load

Some Suggestions for the Inauguration of a Comprehensive Campaign and Salient Features of the Possibilities of the Business

By P. L. Miles

In entering upon any discussion of the subject of electric cooking, there are two factors which merit our first consideration: Will this load be profitable to the central station? Will the electric range be satisfactory to our customers? Upon the answer to these questions, hinges the policy which the lighting company will pursue. For it stands to reason, that if the load offers no attractions from the profit side of the ledger, the interest of the lighting company will be short lived. Looking at the question from the other side of the fence, from that of the consumer, no matter how profitable to the central station the load may be, very little will be accomplished in the way of making progress towards universal electric cooking, unless the customers can be pleased with this method.

It is almost impossible to give even an approximate answer to the first question of profit. Naturally, the rate is the solution. But to give a formula for the creation of cooking rates, is no easy task. Rates for cooking depend upon the hours use of the demand or load-factor, the diversity-factor and the peak load, the cost of generating and distributing the current. These factors vary in different localities, with the consequent impossibility of making any set rule for the establishment of any rate.

There is this one happy medium in the creation of a cooking rate, namely, one high enough to produce a profit and one low enough to produce the business. A 3 or 3.5-cent rate is certainly low enough to produce the business, and the question of whether it will be profitable must be settled by local conditions of the lighting company.

To the sales manager of the electric lighting company, this question of profit is very important. It is not sufficient that ranges be put onto your lines, but it must be seen that the revenue which they produce contains some portion of profit to the lighting company.

RATES FOR COOKING.

Rate, Cents	Number of Towns
5	640
—5	211
4	692
—4	506
3	540
—3	261
2	27
—2	7
Total	2,884

The following rates have been placed in effect in Indiana according to all the data which we have been able to collect:

COOKING RATES IN INDIANA.

Rate, Cents	Number of Towns
5	12
—5	3
4	13
—4	23
3	22
2	4
Total	77

There are probably some central-station managers who will be willing to look to the practice of other central stations, in regard to the establishment of rates for electric cooking, and adopt similar rates in their own properties. This seems a fairly accurate index, as it is hardly possible that these companies have put rates into effect blindly, and with no thought as to the profitableness of the rate. In this respect the accompanying tabulation of rates for electric cooking which have been placed in effect in this country, will probably prove worthy of attention.

There are, according to the above list, 835 towns in this country, which have adopted a rate for cooking of three cents or less, and as stated, it is hardly possible that these managers, have all lost sight of the profit column in making their rate calculations.

As another example, take the Edison Electric Illuminating Company, of Boston, with a statistical department which is second to none, it has created a cooking rate of less than three cents. It cannot be, that this large company did not assure itself of some margin of profit in figuring this rate. There is no question, that it went into the matter in great detail, and arrived at its conclusions after a careful study of known facts.

Attitude of Customers.

The next point to consider is the attitude of customers towards electric cooking. Do they want electric ranges? Is the electric stove better than something they are now using? Will it do the work properly? Will the monthly bills be satisfactory? Will your customers be satisfied after purchasing a range? Will the range stay sold and be the means of selling other stoves?

In order to ascertain these points, the company represented by the author sent investigators to 20 cities and towns throughout the country. These men called on housewives of all stations in life. The following figures are very interesting: 26 per cent of the housewives called upon have considered buying electric stoves; 11 per cent would be willing to pay 100 per cent more than at present; 27 per cent would be willing to pay 50 per cent more than at present.

This alone would indicate an existing interest in electric cooking on the part of the housewives, as well as their absolute willingness to pay more for this class of service. Furthermore, these surprising figures exist in spite of the fact that the housewives interviewed knew little or nothing about many of the advantages of electric cooking; 37 per cent of them knew it was cleanly, while only about 1 per cent knew that it would save on the meat bills; 24 per cent knew that it was more convenient; only 6 per cent were aware that it was cooler, and a mere 3 per cent that it was safer than gas. Not one knew that it gave a constant temperature—a very important factor in all cooking operations.

Rates for Electric Cooking.

The first point to consider in promoting the use of electricity for cooking purposes is the rate to be charged for this class of service. As previously stated, the safe, but rather difficult rule to follow is the adoption of a rate, high enough to insure a profit and low enough to secure the business. No definite recommendations can be given. The question of rates will have to be settled locally by the central-station manager according to conditions.

Installation Charge.

The installation charge, namely the cost of running the wires from the meter to the range, at first seemed to be a hindrance to the selling of ranges. Many central stations

From a paper presented at the meeting of the New-Business Committee of the Indiana Electric Light Association, at Kokomo, Ind., on April 19. The author is sales manager, electrical department, of the Globe Stove & Range Company.

made a charge of $5 or $10, or the actual cost of the work, based on time plus material, for the installation. This necessitated the salesman making two sales instead of one.

This question of installation charge is one of commercial expediency, rather than one of equity. That the customer should pay for this inside wiring—which after installation becomes his property—admits of no argument.

When one housewife was asked to pay this charge, logic would not appeal to her. It was carefully explained that this inside wiring was on her property and was only between the meter and the range. Her answer was: "I don't see why I should pay for the range and then pay to have it installed."

It appears that the best course to pursue is to include the cost of installation in that of the range. The total to constitute the list price. In this manner, only one sale is necessary, and the price quoted covers the cost of the stove, delivered and ready to snap on the energy.

However, the policy of the majority of central stations today is to deduct the cost of installation from their own margin of profit, namely, the discount allowed by the manufacturer. This policy they adopt as a means of aiding their customers in purchasing electric stoves, and, in the early stages of the cooking game, making their proposition as attractive as possible.

Time Payments.

On a subject which has proven its value in many phases of the electrical business, an endorsement is hardly in keeping. But to those central-station men who are opposed to the practice of giving time payments, let me point out that they have been the means of solving the problems of the distributors of many high-priced articles—such as the piano, furniture, kitchen cabinet, and the like. Even in the electrical business time payments have given great impetus to the wiring of homes, and the sale of vacuum cleaners, washing machines, and other appliances. In a sense, time payments offer one solution to the complaint about the high price of the article for sale.

Trial Installations.

A trial proposition on any article, especially those with which the public is unfamiliar, is a sign of confidence that the article will do all that is claimed for it. On the other hand, a refusal to make a trial, carries with it an implied statement that the merchant is not willing to give the purchaser an opportunity to verify what may seem like very exaggerated claims.

Put yourself in the place of one of your customers. If you were asked to make an investment of say, $100, in a new, and, in your opinion, an untried article, would you not feel entirely justified in insisting upon the privilege of returning the article in case it does not prove satisfactory? The clever salesman may give you a list of names who are perfectly satisfied, yet these people are not yourself, and it is your own $100 which you are going to spend, and it is yourself who must be satisfied.

The first thought of the central-station man is to lay too much stress on the fact that a trial installation requires an investment for wiring, which, in case the range is returned, will prove a dead loss. This fact is certainly true, and should the number of ranges which are returned be excessive, then the trial installation would be out of the question. It would not be the fault of the proposition, however, but rather the fault of the range itself.

First Cost of Electric Ranges.

On every hand is heard the statements of central-station commercial men, regarding the large number of ranges which they could sell, were the manufacturers only able to supply them with a range retailing for $40 or $50. In the same breath they tell what a wonderful gas range can be purchased for $40—and they are at a loss to understand the difference in price between the gas and electric. Many of these central-station men earnestly claim that the high price of the electric range is the real reason that is preventing their universal adoption.

Is this not an error in reasoning? Can you point to one single article, placed before a public which is admittedly hard to educate in new methods and things, which has been popularized on the price appeal alone? It is efficient salesmanship which will educate a public to the use of a new article, and not low price. Is the reducing of the price of the range from $80 to $50 going to tell the housewife about the cleanliness of electric cooking? Will it convince her of the convenience and safety of electric ranges? By no means. Is this price reduction in any way going to convince her that all of her cooking operation can be performed in a more satisfactory manner, than on any other form of stove? Is a slash in the price going to convince the housewife that electric cooking is past the novelty stage, and that it is practical in every sense of the word? No, indeed. But salesmanship will do these things and will do them efficiently.

The central-station man calls attention to the price of the gas stove, and states that the electrical manufacturer must put out a stove which will compete in price. Is this true? Do these same men forget the other articles which have been introduced successfully into the homes of the electrical consuming public? Take the toaster as an instance. To my recollection a gas toaster costs something like ten cents. But the cost of the electric toaster when it was first placed on the market was somewhere in the neighborhood of $4—forty times as much. How are the two statements reconciled? You can buy an old sadiron for somewhere around 35 cents. The electric iron used to sell for $5 and some of them sell for this price today. Think of it, fifteen times as much. Yet has this great difference in price retarded the sale of these articles? Take more expensive articles, the washing machine and vacuum cleaner for instance. Compare their price with the price of the old tub and washboard or the broom. Yet these same central-station men are today doing a good business in these articles. Today the electric range is somewhere about twice as expensive as a gas range.

Electric Range Campaign.

In the operation of campaigns to promote the sale of electric ranges, there seems to be a tendency to start the campaign with a great deal of enthusiasm, full-page advertisements, cooking demonstrations and the like. Then because there are not a great many immediate sales, the interest wanes, and the campaign is called a failure.

It is the continuity of an electric range campaign, which will eventually bring results. The full-page advertisements and cooking demonstrations are all right, only as starters. They arouse a certain amount of interest among your prospects, which interest must be maintained until the sale is closed. People are not educated in a couple of weeks. It takes months, if not years. It means keeping everlastingly at it, hammer and tongs. It means the consistent use of every advertising media at your command—continually telling the public about the advantages of electric cooking. Use small space in your newspapers—but use it often. Ten small advertisements are better than one large one.

Put a man on the work whose business is to develop your electric cooking load. If he does not sell a range in a month, or in two months, keep him right on the job. Eventually his work will show excellent results. Where he only sells one range the first month, he will sell twenty the same month a year later.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Boston Edison Advertises Apartments Equipped with Electric Ranges.

The accompanying illustration shows an advertisement appearing in the Boston papers, under the classification of "Real Estate." The practice of the company for some time

Real Estate
COLONNA APARTMENTS
230 Walnut St. - - - Newtonville
The 24 Suites in this new High-Class Apartment Building are completely equipped with Edison Service, including
24 ELECTRIC RANGES
Three to Six-Room Suites at from $37.50 to $65.
Apply at 227 Walnut St.
The Edison Electric Illuminating Company of Boston

Advertisement Paid For by Boston Edison Company.

past has been to so advertise, without expense to owner or agent, buildings equipped with electric ranges. This service is greatly appreciated by customers and is said to be influencing the sale of ranges.

Cooking Campaign in Portland, Ind.

One of the most active municipal plants in the middle west as regards the pushing of electrical appliances is the Municipal Electric Light Plant at Portland, Ind.

It is generally the rule that since municipal plants may not sell appliances themselves, they extend little or no aid to the dealers who could handle such business at a profit.

However, such is not the case at Portland. Through the active efforts of George Nicholson, the superintendent of the Electric Light Department, an admirable working agreement is in effect with Charles Nahrwold, a local electrical contractor, whereby satisfaction is assured to lighting company, contractor and consumer alike.

At present, they are in the midst of a successful electric-range campaign and are going ahead vigorously in the face of a similar campaign waged by the local gas company which was, by the way, started several weeks ahead of the lighting company.

The Portland people are firm believers in the trial proposition as a method of selling articles of known value to their customers. They are applying this to their present range campaign.

Electric ranges are being offered on several weeks' trial and in addition, time payments are accepted. This makes it easy to overcome that objection to the electric range which is often raised—namely, the high cost of the stove.

As an additional inducement to their customers, free installation is made on all electric stoves put out. Many central stations do not do this but it has been found that this one feature alone has sold a great number of the stoves which are now in service.

Globe ranges manufactured by the Globe Stove & Range Company are being used exclusively in this campaign.

This campaign is being watched with special interest by other municipal managers who intend to go after an electric cooking load.

Premium to House-Wiring Customers of Cincinnati Company.

As an inducement to prospects to wire their homes during the month of April, the Union Gas & Electric Company has inaugurated the plan of giving each new customer a coupon, valued at $2.50 if applied on the purchase of any portable lamp on display at the company's display room. So far a large number of coupons have been redeemed. The accompanying advertisement shows the method used by the company in appealing to prospective customers.

ELECTRICITY - The INVISIBLE SERVANT
$2.50 Coupon Free if you wire your home during April
Give your order for house wiring now and receive at once your Free Coupon. You can use it for $2.50 cash in part payment of any portable electric lamp you select at The Electric Shop, 403 Race Street. Ask for our special low price on wiring your house during April. "Wire Your Home" Month. Eighteen months to pay. Phone Main 167, or call at
THE UNION GAS & ELECTRIC CO.
The Union Light, Heat & Power Co.

Advertisement of Cincinnati Company.

A Model "House Electric" in Baltimore

Consolidated Gas, Electric Light and Power Company Operates a Lighting Sales Store Equipped for the Display and Demonstration of Things Electrical as in a Private Home

By Walter R. Moulton

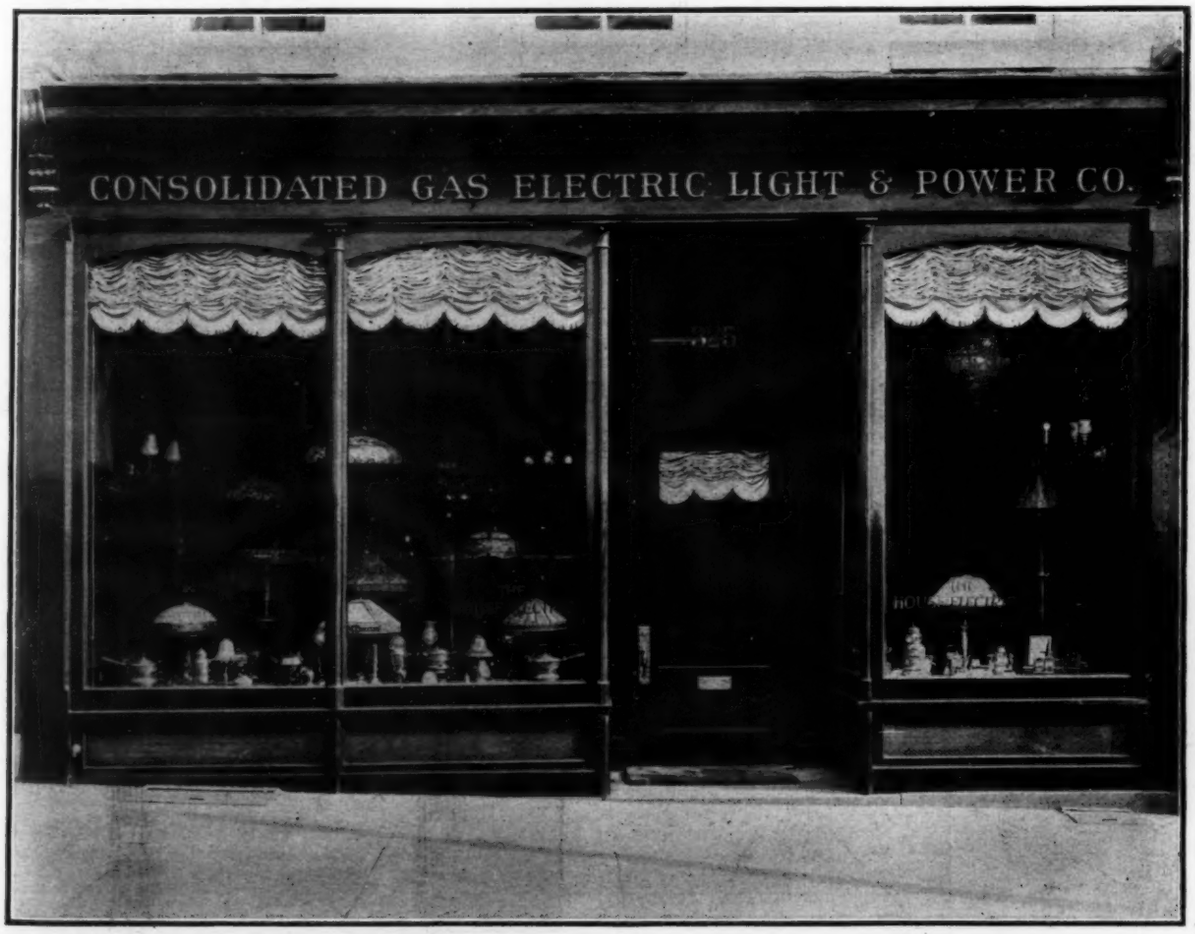
The sale of electrical equipment by the central station plays an important part toward increasing the connected load and toward the saturation of the territory covered by the public service company. Recognition of this fact is shown by the increasing number of public service companies who sell wiring, lighting fixtures and appliances and other electrical equipment to their customers. To properly educate the public in the application and use of various things electrical and to successfully market such equipment on a broad scale, requires show-rooms and demonstration rooms in which their application may be seen under conditions and surroundings that are fitting.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., realized the necessity several years ago, of following the above policy. The territory which it served was very fertile, but undeveloped. The general public was not familiar with the many uses and applications of electricity, nor were many familiar with the development in other cities. Show-rooms were necessary for the demonstration and sale of fixtures and appliances and in order that this might bring the best results an independent store called "The House Electric" was established.

The House Electric is located on Charles Street in the heart of the best retail shopping district. It is a three-story building, having about 30-foot frontage and depth of 140 feet. Proper thought and care have been shown in the design of the exterior. As shown in one of the illustrations, the store front proper is of good design and attractive in appearance, but maintains the necessary dignity of a public service corporation. The show windows are very well finished and always attractively decorated. The actual display in the show windows is changed once a week, in order that the windows may not lose their drawing power. Lighting fixtures and portable lamps are always lighted when displayed in the show window and appliances are arranged as far as possible to suggest their actual use. Of course the show windows are brightly illuminated with the best window lighting equipment and burn until midnight every night.

Lighting Fixtures on First Floor

The entire first floor is devoted to the display and sale of lighting fixtures, portable lamps and appliances. Upon entering the door the customer at once finds himself in a very attractively furnished store. On one side are floor



Entrance of the House Electric of the Baltimore Company.

and wall display cases for the appliances, and a counter on which the various utensils may be examined more closely. In other parts of the store, either on tables or standing on the floor are numerous portable lamps, as shown in two of the accompanying illustrations. The lighting fixtures illuminating the store are very high grade and thoroughly appropriate in an establishment of this kind. When a customer approaches the counter or display cases, he is attracted by additional display in the corridor at the far end of the store and as this is even more attractive than the store proper, he is tempted to investigate further.

The corridor extends the full length of the first floor from the store to the modern kitchen in the rear. The cashier's cage being located about two-thirds of the way back along this corridor, thus it is necessary for customers desiring to pay their bills in the House Electric to become more familiar with displays than would be the case if the cashier was located in the front. All along one side of the corridor as far as the cashier's cage are tables for display of portable lamps, wall outlets showing display of bracket fixtures and ceiling outlets for the display of various types of semi-indirect fixtures. All of the display tables are wired up and fused, and the lamps on display connected up with plugs under the table. Each table is connected by a disconnecting plug to a single-circuit base-board outlet. The bracket outlets are all controlled in groups by means of wall switches located at one position. The ceiling outlets are all controlled individually by means of ceiling pull-chain switches.

In the rear are shown various electrical household appliances and these are also demonstrated in the kitchen. A view of the latter is shown in one of the illustrations.

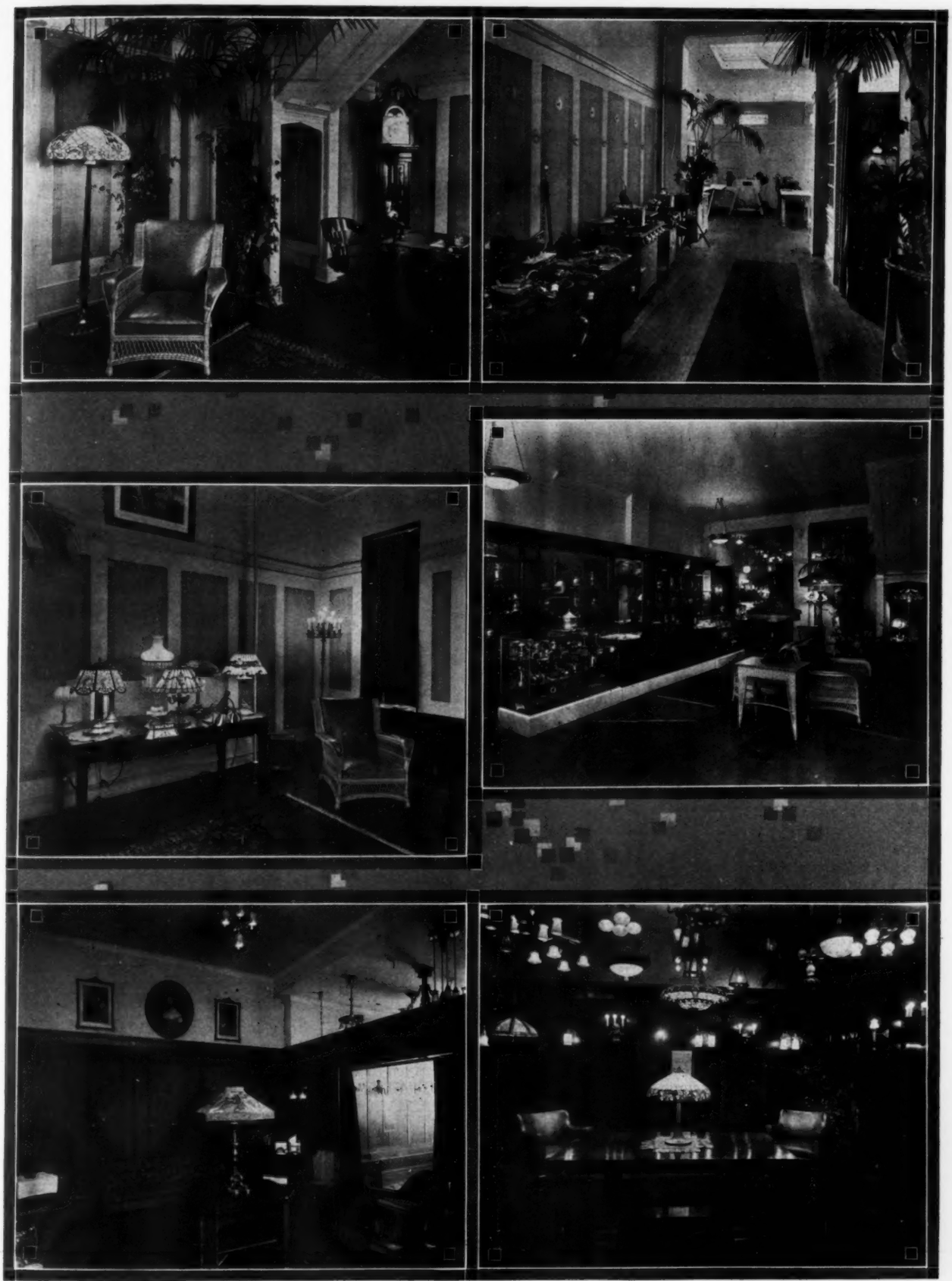
General View of Sales Room.

Numerous Individual Display Rooms

Leading off the corridor on the opposite side are a number of individual fixture display rooms. These are all beautifully decorated and each one is finished in a different decorative scheme. A corner of the first room is shown in one of the views. The woodwork in this room is finished in a light gray and the walls covered with Japanese grass cloth. It will be noted that an individual price tag hangs from each fixture and it is thus a simple matter for the customer to see the price of fixtures for himself.

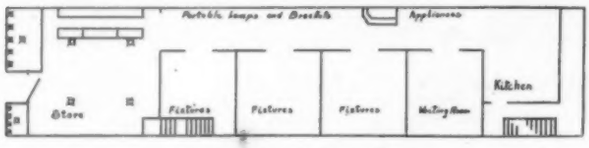
A second room is finished in mahogany, with heavy

Two Rooms at the Baltimore House Electric Showing Display of Floor Lamps and Variety of Ceiling Fixtures and Wall Brackets.



Interior Views of the House Electric of the Consolidated Gas, Electric Light & Power Company, Baltimore.
In this Establishment the Customer Can Be Shown Lamps, Fixtures, Cooking and Heating Appliances and the Great Variety of Other Current-Consuming Devices Under the Same Environments as in a Private Home. All Lamps and Fixtures Are Arranged to Be Controlled Separately by Individual Wall Switches, so that When Desired, Only the Unit Being Displayed Is Lighted.

dark-green leather furniture and a dark-green rug on the floor. The size of these show-rooms is about 18 by 20 feet. On the ceiling of each there are 42 outlets from which to hang fixtures and each outlet is controlled by an individual switch, the large gang switch-



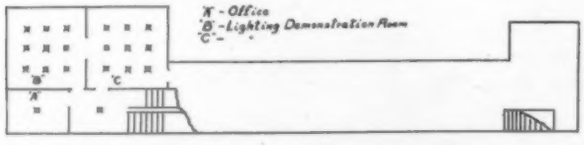
General Plan of First Floor.

plate being shown in the center of the far wall of this display room. Twenty wall bracket outlets in each room are controlled by four switches, two on either side of the entrance of each rooms. In the center of each display room is a large table on which portable lamps are shown and comfortable looking furniture invites the customer to sit down and make himself at home.

The third room is finished in light oak, while the fourth room is papered and finished in dark, soft colors. This room is a rest-room and writing-room for ladies, and tea is also served here to all those who desire it.

Because of the attractive surroundings in all of the display rooms, it is very easy for the prospective customer to imagine the effect of the fixture when hung in his own home, especially as all of the lighting fixtures are hung directly against the ceiling. It will be noted that no daylight enters this entire first floor, except in the store in front, where the sunlight comes in the show windows and doorway. None of this, however, reaches beyond the store proper. Therefore the customer can always judge the effect of the lighted fixture or lamps and imagine the result to be expected in his own home. A great variety of fixtures and portables are shown, and the prices vary widely so as to cover practically every pocketbook. The general plan of the first floor is shown herewith.

On the second floor are two special display rooms for the demonstration of modern illumination. These rooms are about 17 by 18 feet with 11-foot ceilings. The windows are equipped with two sets of curtains, so that it is possible to exclude all daylight. The ceiling outlets in each room are each controlled by an individual wall switch located near the entrance of the room. The center outlet in each room is equipped with a single fixture, either totally indirect or semi-indirect, sufficient to ordinarily light a room of that size for close reading. The four corner outlets are equipped with fixtures of some one style of proper size to illuminate the room from four outlets. The four remaining outlets in the center of each side of the room are equipped with still different fixtures. By the proper arrangement of fixtures on display and proper control of the switches, it is a simple matter to demonstrate the several modern methods of lighting and not only sell the customer lighting fixtures, but also to sell him good illumination. This special display has been pro-



Arrangement of Ceiling Outlets on First Floor.

ductive of excellent results, although it was not originally planned with the opening of the House Electric, and in fact has now been in use for about two years.

The remainder of the second floor is used for office space and stock room, while the entire third floor is used for clerical offices and fixture shop.

Appealing to Men in Vacuum-Cleaner Campaign.

That spring house cleaning is robbed of its terrors to the man of the house, by the introduction of the electric vacuum cleaner, is the appeal which the Central Maine Power Company advances in advertising this useful household appliance. The familiar warning, "You'll have to get out," uttered by the wielder of a duster and broom, is no longer heard in the house. The husband can remain in peace and comfort, the furniture doesn't have to be moved out of the room, nor all the windows opened. "Old fashioned cleaning days, with their wearisome chaos, are but memories," says the ad.

The company demonstrates their use in the prospective customer's home.

Low Operating Cost Will Be Advertised in Fan Campaign.

Two features will be widely advertised in the summer fan campaign to be put on by the Texas Power & Light Company this year. One of these will be a small cash payment and easy terms and the other will be operating cost.

In spite of the fact that all persons having an intimate

Illustration to Be Used in All Fan Advertising of Texas Company.

knowledge of the electrical business know that it costs little to operate a fan, a great many laymen do not understand this, and have a tendency to judge current consumption by the size of the appliance rather than the actual electrical characteristics. To overcome this prejudice a vivid comparison between a 60-watt lamp and a 12-inch fan will illustrate all the advertising matter used in this campaign. The current consumption at various speeds will also be given and the efficiency of the fan commented on. No matter at what price energy is sold, anyone can understand the simple statement that "this fan uses less current than this 60-watt lamp." Complete details of this campaign will be given in a later issue.

Nashville Wiring Advertisement Brings Results.

Taking a "tip" from local successful advertisers, the Nashville (Tenn.) Railway & Light Company has added an interesting feature to its house-wiring campaign by an advertisement in the daily papers written in the form of a newspaper story. The article is a description of the methods by which wiring is done in houses already built. It features the fact that this kind of wiring may be done without tearing up walls and floors or creating any disorder in the house. The fact that this sort of advertising is the favorite method of the proprietary medicine man, whose chief skill is his appeal to the public, indicates that it can be made highly useful. The article itself was taken from a pamphlet on house-wiring but will be read by many who would not heed a circular or an ordinary display advertisement. The company, through the campaign which was described in these columns recently, and in which this is a feature, added more than 100 new customers in March.

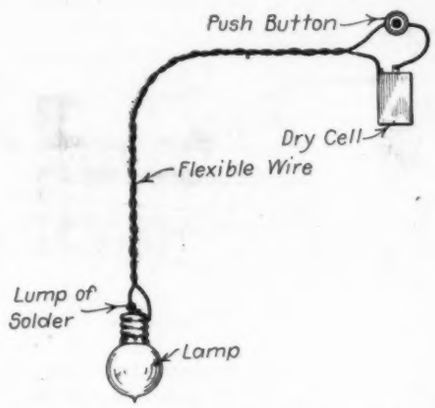
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

SMALL EXPLORING LAMP FOR AID IN FISHING IN PARTITIONS.

By R. F. Cooke.

An excellent exploring lamp that is safe and is valuable in wiring old houses where much fishing has to be done is made as follows: Take a small battery lamp and solder two small flexible wires to it as shown, putting a lump of solder on the end contact or butt to give it weight. To the other ends of the wires connect a push button and battery. This lamp can be lowered into a partition through a small hole and the interior of the partition examined



A Small Exploring Lamp for Aid in Fishing in Partitions.

for some distance each side of the lamp and clear to the bottom. I have seen candles used for this purpose, but this is very dangerous.

An Effective Church Lighting Installation.

An example of unusually efficient interior lighting is that of St. Patrick's Church, Natick, Mass., in which 200-watt nitrogen-filled incandescent units are installed in 16-inch Brascolite bowls. There are 12 groups of fixtures in the nave, six on either side, suspended by chains under

A Noteworthy Lighting Installation in a Massachusetts Church.

the arches, 18 feet above the floor, flush with the top of the columns.

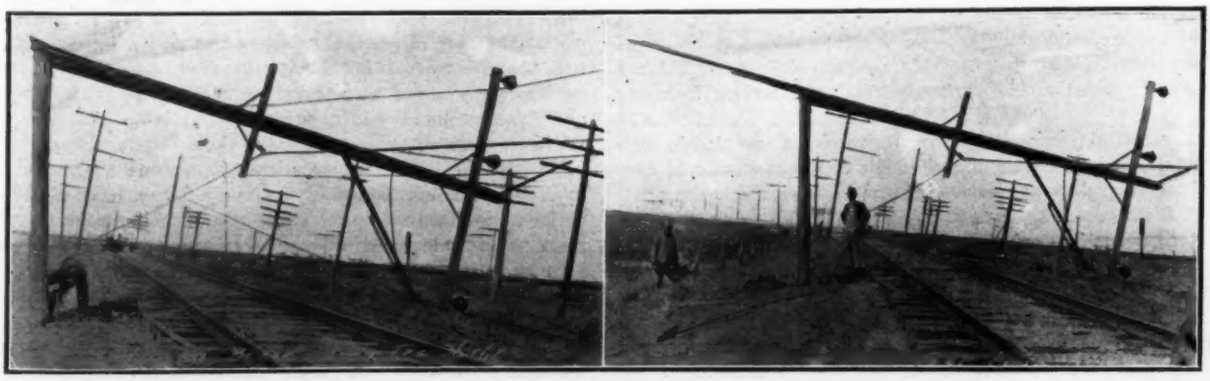
Above each fixture, which is of heavy bronze, are eight candle fittings with frosted balls containing 25-watt tungsten units.

A similar group fixture is installed over the organ space in the gallery and in the vestibule. A like unit, with Brascolite fixture and 200-watt nitrogen lamp, is in the sacristy. Edwin C. Lewis, Incorporated, Boston, was the contractor for the installation.

Benefits of Storm Guying.

The accompanying illustration shows a view of a section of transmission line blown down in a Texas storm. As will be noted, the break is practically square. A large number of poles were similarly broken off or blown over in the storm.

A very noticeable feature was the fact that the last pole standing had side storm guys on it. If it had not been for these guys there is no doubt but that quite a few more poles would have been blown down.



Two Views of a Texas Transmission Line After a Storm, Showing Resistance of Guyed Poles.

Alternating-Current Motors—I

By Justin Lebovici

The first installment of this article considers the fundamental principles upon which the design and performance of alternating-current motors depend. The next installment will deal with the classification of the different types and the reasons for the possession of different characteristics. While the laws of electromagnetic action are expressed in mathematical terms, the descriptions will be found readable without knowledge of mathematics.

Considering the widespread use of the alternating-current motor in all branches of industry, it becomes important for a great number of persons handling these motors to properly understand and apply the principles underlying the performance of these machines.

Due to the fact that out of thousands of engineers dealing with alternating-current motors, there is hardly one who is called upon to design a machine from the ground up, the writer will omit from the following discussion such matters as are of prime importance to the designing engineer only. More consideration will be given to the performance and test of the various types of motors in order to enable the reader to get to the credentials of the machines in the form of their performance curves and so put him in a position to decide as regards the ability of a certain type of motor to perform the work desired. It is intended to include enough of the calculations to satisfy those who intend to make modifications in an existing motor with a view of meeting special requirements. Such changes consist mainly in modifying the windings or winding connections. For this reason a great deal of space will have to be devoted to a description of the various windings used in alternating-current motors, and some space to the more common methods of insulating and protecting windings against the unavoidable destructive forces at work in such structures.

It is assumed that the reader is in a general way familiar with the fundamental laws of electromagnetism, that he has some knowledge of the lower branches of mathematics and that he is acquainted to some extent with the mechanical construction of the apparatus involved. We will begin with a brief review of the fundamental laws.

The construction and performance of the alternating-current motor rest on relatively few fundamental laws.

The Laws of Electromagnetic Induction.

We shall use the following notations: small letters for instantaneous values and capital letters for effective values of electromotive forces and currents; also small letters for instantaneous values and capital letters for maximum values of flux, Φ, magnetic field strength, H, and magnetic flux-density, B.

In an electric conductor moving relatively to a magnetic field, an electromotive force is generated. Assume the conductor to be one centimeter long and moving in a magnetic field of uniform flux-density equal to B lines per square centimeter with a velocity of v centimeters per second in such a way that the direction of the magnetic field, the direction of motion and the conductor itself are at right angles to each other. Then the electromotive force (e) expressed in volts, induced in the conductor can be computed from the following formula:

$$e=Blv10^{-8} \text{ volts} \quad (1)$$

For this electromotive force to give rise to an electric current (i) it is necessary that the ends of the conductor be connected in such a way as to form a closed circuit. The product Blv represents the rate of increase or decrease of the flux interlinkages (ϕ) of this circuit.

Coiling the conductor N-fold increases the electromotive force N-fold by increasing the number of interlinkages in turn.

If the flux changes during the time t from the value ϕ_1 to the value ϕ_2 we can write the law (1) in the following form:

$$e=-N(\phi_2-\phi_1)10^{-8}/t \text{ volts} \quad (2)$$

The negative sign in formula (2) indicates that the magnetic field of the current produced by this electromotive force has a tendency to oppose the magnetic field generating this current, if it be increasing.

The magnetic field produced by the current is called its magnetic reaction. Lenz's law states that the magnetic reaction takes place in such a direction as to oppose the change.

In a one-turn coil, AA_1 (see Fig. 1) revolving with a uniform velocity through a uniform magnetic field, the flux inclosed by the coil at any instant t is equal to $\phi \cos \alpha$, if we denote by ϕ the maximum flux inclosed by the coil at the instant $t=0$, or when the coil is in position aa_1 and by α the angle through which AA_1 has passed in the time t. An electromotive force will be induced in the coil, and from law (2) it can be easily seen that at the time $t=0$ or when AA_1 passes the horizontal, ϕ_2 and ϕ_1 are very nearly equal and of the same sign at two instants very near to each other (for instance for

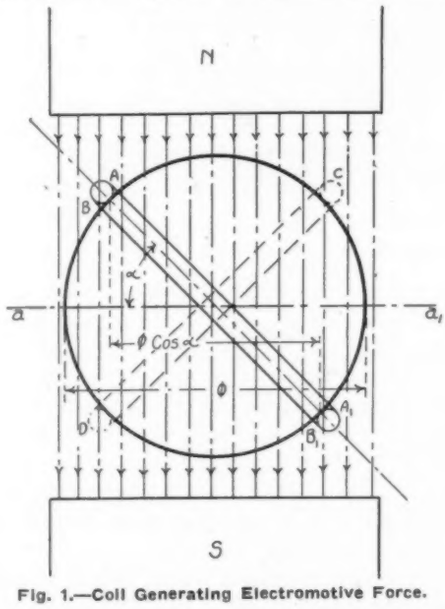


Fig. 1.—Coil Generating Electromotive Force.

$\alpha=5°$) and in consequence the induced electromotive force at this instant is zero. It is to be noted that at this instant the flux interlinked with the coil ($\phi \cos 0°$) is a maximum. On the other hand consider AA_1 when in a vertical position. For $\alpha=85°$ the flux enters the coil from the side AA_1 in a direction opposite to that for the instant when $\alpha=95°$. ϕ_2 and ϕ_1 in formula (2) are again nearly equal, but of opposite sign, and the electromotive force at this instant is a maximum. At this instant the flux interlinked with the coil is zero.

We can express this mathematically by saying that the electromotive force varies according to a sine curve when the flux varies according to a cosine curve. We can show this graphically as in Fig. 2.

Calling T the time necessary for the coil to make one revolution, we note that during this time the wave passes through all its positive and negative values. We call this time a cycle and the frequency (f) is equal to the number of cycles per second.

We can write the following proportion

$\alpha : 2\pi = t : T$ and noting that $fT=1$ we have for the instantaneous value of the electromotive force, according to Fig. 2,

$$e=e_{max} \sin \alpha = e_{max} \sin (2\pi t/T) = e_{max} \sin 2\pi ft \quad (3)$$

Applying formula (2) to the case of the coil for $\alpha=0$ and $\alpha=180°$ we see that $\phi_2=-\phi_1=\phi$ and we obtain for the average electromotive force during one-half cycle

$$e_{av}=2\phi N 10^{-8}/t \text{ volts, or since } t=f/2$$

$$e_{av}=4fN\phi 10^{-8} \text{ volts} \quad (4)$$

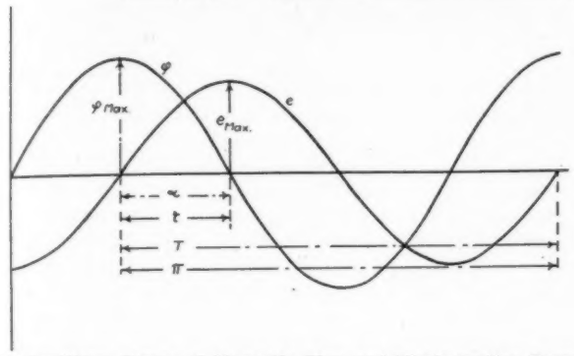


Fig. 2.—Wave Forms of Magnetic Flux and Electromotive Force.
(In this figure, π should read 2π.)

Assuming the maximum ordinate of the sine wave to be equal to e_{max} and the wave-length of the curve equal to 2π, then we have to discriminate between

(1) The instantaneous value $e=e_{max} \sin \alpha$ (5)

(2) The average value of the half wave $e_{av}=0.636 e_{max}$ (6)

(3) The effective value, or the square root of the mean square, $E=0.707 e_{max}=e_{max}/\sqrt{2}$ (7)

The form-factor $F=E/e_{av}=0.707/0.636=1.11$ (8)

Unless otherwise stated, we shall assume in what follows a sine wave shape for the currents, electromotive forces and fluxes.

It follows then:

$e_{max}=e_{av}/0.636=2\pi fN\phi 10^{-8}$ volts (9)

$E=1.11 e_{av}=4.44fN\phi 10^{-8}$ volts (10)

$e=2\pi fN\phi 10^{-8} \sin 2\pi ft = 2\pi fN\phi \sin \omega t 10^{-8}$ volts (11)

If ϕ be the maximum number of lines of flux inclosed by the coil, ϕ being assumed to vary as a sine function of time (t) with a frequency f, then the effective electromotive force induced in a coil of N turns can be computed from the following formula:

$$E=4.44fN\phi 10^{-8} \text{ volts.}$$

If the flux does not vary as a sine function of time, formula (10) may be written generally:

$$E=4Ffn\phi 10^{-8} \text{ volts} \quad (12)$$

F is called the form-factor of the wave, and depends upon the distribution of the magnetic flux in the magnetic field and represents the ratio of the effective to the average value as indicated before in (8).

Self Induction. Phase Displacement.

In alternating-current circuits it is to be noted that the maximum values of the electromotive force and current do not always coincide. An important part of the phenomenon called electric current is the magnetic field which appears and disappears and varies with the current producing the same. The flux ϕ_s produced by a current i is proportionate to the current itself and we can write $N\phi_s=Li$, or $L=N\phi_s/i$ where ϕ_s varies, the same as the current i, according to the sine wave.

The factor L or the flux produced by a unit current in this circuit is called the coefficient of self-induction. The flux ϕ_s produces an electromotive force of self-induction e_s according to (2). This electromotive force is called the reactance voltage and according to (11) we can write $e_s=2\pi fN\phi_s 10^{-8} \sin \omega t$ volts, or

$$E_s=2\pi fLI=xI \quad (13)$$

the factor $x=2\pi fL$ is called the reactance of the circuit.

Due to the presence of this electromotive force of self-induction the maximum and zero values of the electromotive force and current do not occur at the same time. The current reaches its maximum value a little later than the electromotive force, but the time necessary to complete a full cycle is the same for both the current and the electromotive force. We express this by saying that in a circuit having self-induction the current lags behind the electromotive force or the electromotive force leads the current. The angle (say θ) by which the current lags behind the electromotive force is called the angle of phase displacement.

The magnetic field of the current generates the electromotive force of self-induction in the conductor carrying the current. This magnetic field is sometimes called the magnetic reaction and is always in such a direction as to oppose its cause (Lenz's law).

The phenomenon of self-induction therefore has the effect of an increased resistance to the flow of alternating current in the circuit. This increase in resistance is measured in the same unit as the resistance with which we are familiar from direct-current work, i. e., the ohm.

An alternating current of frequency f flowing through a circuit having a resistance of r ohms and a coefficient of self-induction L, encounters an apparently increased resistance z called the impedance of the circuit, which is measured in ohms the same as the resistance (r) and reactance (x).

$$z=\sqrt{r^2+(2\pi fL)^2}=\sqrt{r^2+x^2} \quad (14)$$

The impedance can be represented graphically as the hypotenuse of a right-angle triangle having as legs the resistance and the reactance as given in the last equation. This is shown in Fig. 3, where

$$\tan \theta = x/r \quad (15)$$

For alternating-current circuits Ohm's law is most conveniently written in the following form:

$$I=E/\sqrt{r^2+(2\pi fL)^2} \quad (16)$$

Multiplying all sides of Fig. 3 by the current I we obtain the diagram shown in Fig. 4, where all sides represent electromotive forces in place of values measured in ohms.

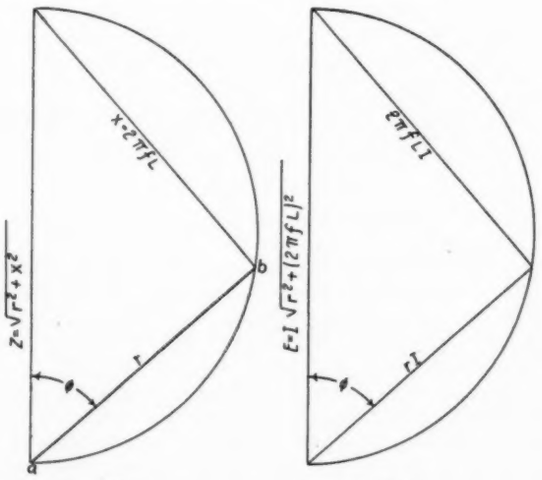


Fig. 3.

Fig. 4.

Power Consumed in Alternating-Current Circuits.

Referring to Fig. 4 we see that the electromotive force

$$Ir=E \cos \theta = E_r \quad (17)$$

is consumed in the resistance while the electromotive force

$$2\pi fLI=Ix=E \sin \theta = E_l \quad (18)$$

is consumed in the reactance. The total electromotive force is consumed in the impedance z or

$$E=Iz \quad (19)$$

The power (p) in watts consumed at any instant by the circuit is the same as in a direct-current circuit or

$$p=ei=\sqrt{2}E \sin \alpha \sqrt{2}I \sin (\alpha+\theta) \quad (20)$$

if we denote in equation (3) $2\pi ft$ by α, θ being the phase dis-

placement between current and electromotive force as explained above. The average power p becomes

$$P=IE\cos\theta=IE_w=I^2r \quad \text{.....(21)}$$

We see that only the resistance consumes power in the circuit. The power consumed in the circuit is independent of the reactance or the self-inductance and the reactance does not consume any power. This is the reason why the component $E_1=E\sin\theta$ given in equation (18) is called the wattless component of the electromotive force. The component E_w (equation 17) is called the watt component or power component of the electromotive force.

From equation (21) we see that the average power is represented by the product $I\times E\cos\theta$, or $E\times I\cos\theta$. The factor $I\cos\theta$ is called the watt component of the current, the same as $E\cos\theta$ was called the watt component of the electromotive force.

The factor $\cos\theta$ is called the power-factor of the circuit and plays an important role in all alternating-current problems. A low power-factor is detrimental to both the generation and transmission of power.

The Magnetic Circuit of a Machine.

A law similar to Ohm's law for electric circuits is the law

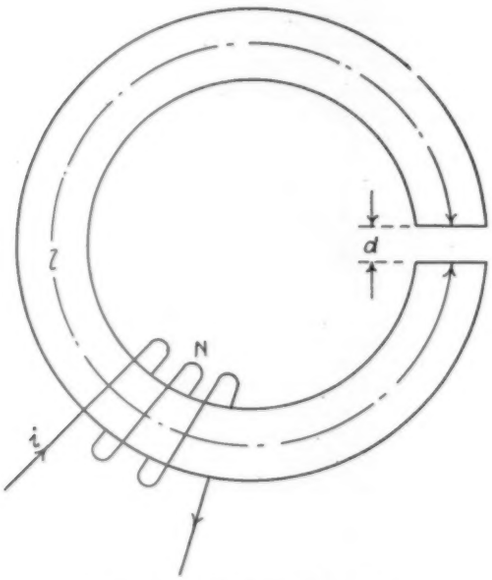


Fig. 5.—Simple Magnetic Circuit.

for magnetic circuits. This law states that the flux (ϕ) interlinked with a coil of N turns carrying a current I (outside of the field of other magnetic forces) can be represented as a ratio of two quantities: the magnetomotive force and the reluctance or magnetic resistance of the path of the flux.

$$\phi=\text{magnetomotive force/reluctance}=0.4\pi\sqrt{2}IN/\text{reluctance} \quad \text{.....(22)}$$

$\sqrt{2}IN$ are called the ampere-turns.

The reluctance varies directly as the length of the path, inversely as its area of cross-section (provided the cross-section is uniform) and is dependent upon the permeability μ of the material forming the path of the flux. If the area of the path is not uniform, it can be subdivided into parts having the same cross-section, for which this last assumption holds. Take the simple magnetic circuit shown in Fig. 5, in which

A=cross-section of the magnetic path in centimeters.
l=the length of the iron path in centimeters.
μ=the permeability (being 1 for air).
d=length of air gap.

$$\phi=0.4\pi\sqrt{2}IN/(A/d+A/\mu l) \quad \text{.....(23)}$$

For the air gap we can write $\phi=BA$ .....(24)

B being the magnetic flux-density, or the number of lines per square centimeter in a magnetic medium. The number of lines per square centimeter in air produced by the same magnetizing field is called the field intensity. These two quantities are related to each other as shown by the equation

$$B=\mu H \quad \text{.....(25)}$$

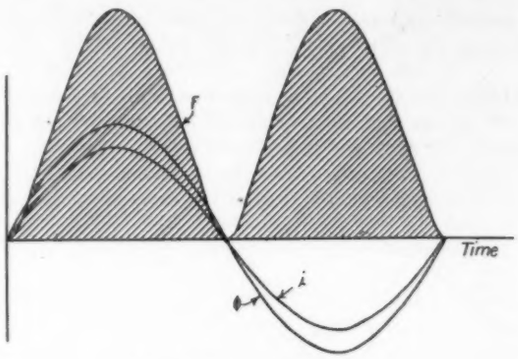


Fig. 6.—Variation of Force.

Forces Produced by a Magnetic Field and an Electric Circuit.

A conductor through which a current flows has, when brought into a magnetic field, a tendency to move in a direction perpendicular to the plane formed by the electric conductor and the lines of the field. This force (F) can be computed from the law of Biot and Savart. If the length of conductor be l centimeters and the same be carrying i amperes, the magnetic

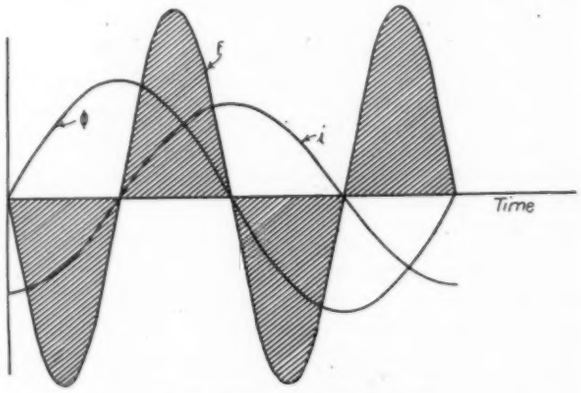


Fig 7.—Average Force is Zero.

induction be B and the angle which B forms with l be designated α, then the force is

$$F=lBi\sin\alpha/9.81\times10^6 \text{ kilograms} \quad \text{.....(26)}$$

In all motors $\alpha=90°$ so that we can write

$$F=lBi/9.81\times10^6 \text{ kilograms} \quad \text{.....(27)}$$

It is to be noted that the force is maximum when the conductor carrying the current and the flux are at right angles to each other in space, for in this case $\sin\alpha$ becomes unity.

If the current and flux are alternating in character, the time phase of these quantities has to be considered. Suppose the flux to be maximum while the current is zero; evidently in

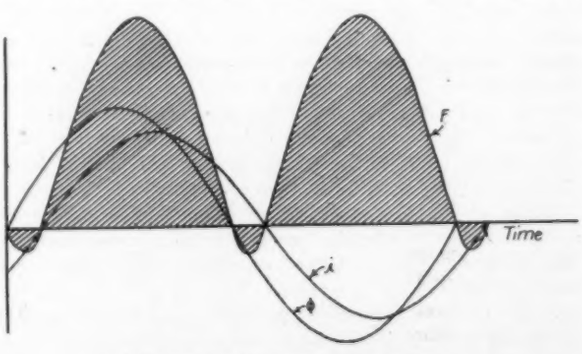


Fig. 8.—Slight Phase Displacement.

this case the force will be zero, though the current and flux may be in the right space position for producing force by their combination.

It follows that if the flux and current are not constant in value the best condition for producing torque is obtained when these two quantities are in space quadrature and in time phase.

In Fig. 6 the flux ϕ and current i are varying in a sine wave; the product of the two, to which the force is proportional, is shown as line F. In this figure it is assumed the current and flux are in time phase.

In Fig. 7 the flux ϕ and current i are in time quadrature. It is easily seen that in the first case, while the instantaneous force F due to simple alternating fluxes and currents is pulsating in character, it is positive at all instants and the average force due to the sum of the instantaneous values has a positive value. In the second case the resultant average force, which is proportional to the sum of the positive and negative instantaneous values of F, is zero. For any other angle of phase displacement between the current and flux, as shown in Fig. 8, the force is nearer to the ideal case shown in Fig. 6 the smaller the angle or the nearer the current and flux are in phase.

Polyphase Currents.

If in Fig. 1 we place on the revolving cylinder besides the coil AA_1 another coil CD at an angle of 90° with AA_1 then the coil CD will assume in space the same positions as AA_1 and we will have induced in the coil CD all the instantaneous values that have been induced in coil AA_1. The time necessary for the coil AA_1 to reach the position CD corresponds to a

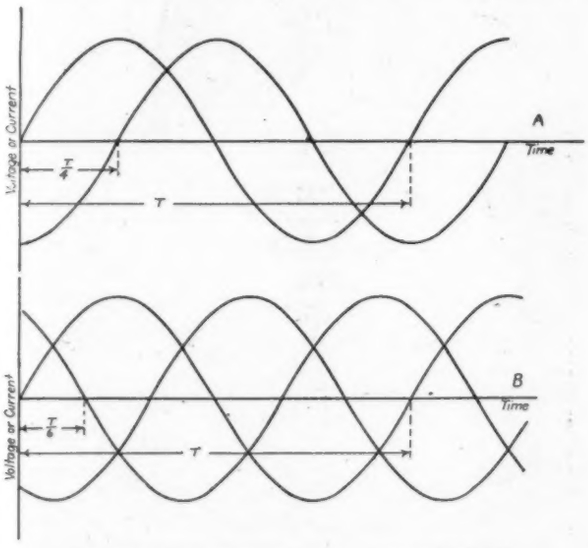


Fig. 9.—Two-Phase and Three-Phase Systems.

quarter cycle. The electromotive forces induced in the two coils AA_1 and CD are independent of each other, their instantaneous values are the same but occur at different times. In the above illustration the maximum values occur $T/4$ seconds apart. T represents the time of a complete cycle, as before. We call this system a quarter-phase or two-phase system. Fig. 9A represents graphically a two-phase system of electromotive forces or currents. If in place of two symmetrical, independent coils we had used three coils 60° apart, we should then have had a three-phase system, Fig. 9B. Analogously we can obtain an n-phase system of electromotive forces or currents.

A circuit using only one phase is called a single-phase system, while an n-phase circuit is called a polyphase system.

All that has been said up to this point applies to any one phase of a polyphase system.

(To be continued.)

AMONG THE CONTRACTORS.

Russell & Company, electrical contractors, 444 Columbus Avenue, New York City, have been awarded the contract for a large residence at Manursing Island, Rye, N. Y. This work includes electric-light and power wiring, rigid conduit throughout, intercommunicating telephone system, electric re-set annunciators, high-tension underground feeders with manholes and transformer vault, high-grade slate switchboards and panelboards in fireproof cabinets. It further includes electric fire alarm, burglar lamps, and electric heating in bathrooms.

NePage, McKenny & Company, electrical engineers and contractors, Armour Building, Seattle, Wash., announce that Samuel A. Sizer has joined the company as secretary-treasurer and principal stockholder. Mr. Sizer is a large real estate and timber owner of Seattle.

The McKeever Electric Company, Columbus, O., has been awarded three contracts for large electrical installations, the Seneca Hotel, of that city, an eleven-story building to cost $400,000, being the largest. The contract covers the electrical work complete, exclusive of fixtures and appliances. A new unit of the Ford automobile assembling plant at Columbus, which will be an exact duplicate of the original building, calls for electrical work to the amount of $4,500. In the Masonic Temple, at Ironton, O., one of the features of the contract will be the wiring of an auditorium with regulation stage.

The Standard Electrical Construction Company, San Francisco, Cal., has been awarded the wiring contract for the addition to the Standard Oil Company's building in that city.

The Hibbard Electric Company, Fitchburg, Mass., took a novel means of inducing prospects to have their houses wired, offering to pay the first month's lighting bill of anyone having his house wired or fixtured by it during the month of April.

The Bradley Electric Company, Council Bluffs, Iowa, has moved into new quarters at 331 West Broadway, giving the company a considerable increase in floor space. New fixtures and store appointments have been installed.

Effect of Imperfect Dielectrics in the Field of a Radiotelegraphic Antenna.

The loss of electrical energy in an antenna is caused by the resistance of the antenna. The so-called radiation resistance is a measure of the portion of the energy usefully dissipated in the emission of electromagnetic waves. The remainder of the resistance causes a useless dissipation of energy that should be reduced to a minimum.

It has been previously noted that, in the region of the longer wave-lengths, the resistance of an antenna increases with increasing wave-length and the explanation has been offered that this is caused by dielectric absorption or a loss of energy such as that which takes place in a poor condenser and that it is probably caused by the ground. However, the Bureau of Standards, Department of Commerce, finds that the loss does not take place in the ground, but in poor dielectrics in the electric field of the antenna, such as wooden masts, trees, insulation, etc. Running the leads into a building may increase the resistance unless the interior walls are covered with metal screen and connected to ground. It is important, therefore, to reduce to a minimum these sources of energy loss in designing an antenna.

The report on this subject is Scientific Paper No. 269, entitled "Effect of Imperfect Dielectrics in the Field of a Radiotelegraphic Antenna," and copies may be procured, gratis, upon application to the Bureau of Standards, Washington, D. C.

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Combining a Moving Element With a "Wire-Your-Home-Month" Display.

The advantage of moving elements in a window display are very well recognized, and a great deal of effort has been made and much ingenuity exhibited in many electrical merchandising windows. A novel display combining a moving element with "Wire-Your-Home" Month, and also possessing some educational features was shown in the window of the Commonwealth Edison Company's Electrical Shop, 72 West Adams Street, Chicago, Ill.

Commonwealth Edison Company "Electric Shop" Window Display During House-Wiring Campaign.

The moving element was an arrow attached to a motor-operated arm, the latter being arranged to stop at regular intervals before one of five placards which told what a few cents' worth of electricity will do in the home. Monthly costs for average use of an electric percolator, grill, flat-iron and toaster, and cost of 50-minutes' use of a chafing dish were given on the placards. The appliance referred to in each case was placed in front of the placards. Numerous other appliances, which form conveniences only after one has his home wired, formed the remainder of the window display.

Co-operating with the "Wire-Your-Home-Month" Campaign.

Display windows are becoming such a potent factor in good advertising that many companies are making special efforts in that direction. The accompanying illustration is one of a number of window displays made by the Superior (Wis.) Water, Light & Power Company in connection with the "Wire-Your-Home" campaign which ends this week.

The houses shown in the rear of the display were painted on wall board, with windows cut out and lights behind the two end houses. The arrows on the cards pointed out the objects for which the wording was intended. Sweeping compound was spread on the floor and simulated grass very effectively, and the pole line and cement walk added a degree of naturalness.

The company made every effort to make "Wire-Your-Home Month" a success in Superior, and the results have shown a large increase over other years in the number of houses wired during this season. Newspaper advertising, circular letters and personal solicitation were used very effectively. A house owner was advised to secure an electrical contractor for wiring his house, the company paying the contractor for the cost of the work, deducting six per cent for cash. The cost was then divided into 12 payments and added to the monthly bills for service. If the resident of a house owned the property he was given an electric iron or a toaster when the service connection was made.

Sales Manager Christopher stated good results were always obtained when the company tied up its local campaigns with a national campaign such as "Electrical Prosperity Week" or the house-wiring campaign. He expressed the opinion that an impetus was given to a local movement that was not attainable in any other way.

House-Wiring Campaign Display Window of the Superior Water, Light & Power Company.

Merchandising Small Electrical Devices.

In order to dispose of a number of lines of small electric appliances that move rather slowly at times, a certain merchandiser tries the scheme of placing a few of these devices, such as toy motors and transformers, dimalites, multiple sockets and small heating devices, on a table near the entrance to his store. Passing customers stop and pick them up for examination or to "see how they work." The sales efforts amount to practically nothing, but the results are always very satisfactory.

Sales Factors in a Washing-Machine Campaign

Assembly and Use of Fundamental Sales Principles Results in the Merchandising of a Carload of Electric Washers in Minneapolis

"In union there is strength" is a maxim that has become modernized to "in co-operation there is strength." Usually the thought is of individuals or individual business enterprises co-operating to give greater strength, but the same thought may be applied to uniting the various factors that are of benefit to a movement. Each one of these factors used as a unit of driving power, then amassed, their functions interwoven and used collectively, give the best results in the attempt to accomplish the ultimate end, which, of course, is the desired result.

A thorough understanding of sales factors, which may be enumerated in part as sales organization, analysis of the market, special appeals to the public, window-display, advertising, demonstration, and the like, and which may be termed the levers of merchandising, followed by their coherent and skillful usage is sure to result in merchandising of a highly successful degree. A thoughtful direction of every factor, rather than hurriedly increased effort, brings the highest percentage of net results.

The opportunity and necessity for using sales factors in their highest degree is given to the merchandiser of electrical appliances because in the majority of instances the business requires pure salesmanship, rather than order-taking. The reason for this is that the sale of electrical appliances does not resemble that of staple household necessities. They only become so after their introduction into the home, where their convenience and utility transpose them into necessities. Electrical appliances demand explanation and demonstration before their introduction can be secured; in other words, exploitation. And in exploiting an article all the principles of expert salesmanship are called into use.

Hence, the necessity for campaigns for the sale of electrical appliances. But a campaign is not a sale. It is much more. The dictionary meaning of campaign is "a connected series of operations to bring about a desired result." And since a "connected series of operations" sounds familiarly like "co-operation," we may say a "co-operation to bring about the desired result" is a campaign; that is, the co-operation of the sales factors.

These opening paragraphs are in explanation of the fundamental principles used in the sales work of the Sterling Electric Company, 33 South Fifth Street, Minneapolis, Minn. They were employed in formulating and carrying out plans for what proved to be a very successful electric washing-machine campaign, which was of two weeks' duration and which ended April 1.

A careful survey of the prospective field was the first movement in the campaign. An analysis was made of the company's list of prospective washing-machine customers and a review of the estimated sales in the city as a whole. In other words, the analysis of the market, which, though briefly stated, meant many hours of detail work and planning. The new residential rate of the Minneapolis General Electric Company for electricity, which became effective March 1, was a stimulus to the public for the use of additional labor-saving and convenient electrical appliances and was an important factor in aiding the Sterling Electric Company's campaign.

A carload of "Gainaday" electric washing machines, manufactured by the Pittsburgh Gage & Supply Company, Pittsburgh, Pa., was ordered some months in advance, and delivery secured so the campaign could be started March 15. It was decided to make two weeks the limiting time in which to dispose of the machines. The established retail selling price of this particular machine is $105, and at no previous time had the price even been varied. However, during this campaign customers were given a special discount of $5. All that was required for the first payment was $5, this to be followed by regular monthly payments of $7.50 until the total purchase price was paid. Under regular conditions the company stipulates a first payment of $20, followed by monthly payments of $10.

With terms established and the stock of machines on hand, the whole plan of the campaign was ready for its unfolding. Preparations were made for getting the public firmly interested, and here the preliminary plans for advertising were called into play. The first indication to the public of an electric washing-machine demonstration and sale was given by the insertion of a number of so-called "teaser" advertisements in the Minneapolis daily newspapers during the week preceding the sale. One of these "curiosity-arousers" is reproduced. The day before the opening of the campaign half-page advertisements appeared in two of the evening newspapers, a full announcement of the demonstration, sale inducements, terms of payment, and description and advantages of the machine being given. Special emphasis was laid on the mode of operation and

A Close-Up View of the Two Contrasting Window Displays of the Sterling Electric Company.

One of the "Teaser" Advertisements.

the fact that a five-year guarantee went with every machine.

Because housewives of Minneapolis do not, as a general rule, read the morning newspapers, all advertising for the campaign was placed in the evening publications. The advertisements were very explicit, being designed to give the interested housewife an opportunity to read many of the answers to questions she would have in mind regarding the convenience and operation of an electric washing-machine in her own home. Avenues were prepared leading up to the desirability of seeing the demonstration and in preparation of opportunities for the demonstrator and salesmen to repeat the talking points given in the advertisements and then climaxing a sale by giving additional talking points. The advertisements were continued during the campaign, being reduced to one-fourth page and inserted every other day, former experiences proving to the company that nearly as good results were obtained in this way as with daily insertions.

Originality and timeliness in window displays have become characteristic of the Sterling Electric Company. In describing this campaign it would not do to recite the number of unique and timely displays made in the past few years, but the accompanying illustrations serve to show the originality used in window display during the washing-machine campaign. The company has two show windows, with the entrance to the store between them, which, added to the fact that there is an alley on one side of the store, gives a maximum of window frontage. The two windows are often used for displaying contrasting exhibits, and this idea was used in the campaign.

The old method of doing the family washing, with its accompanying disorder and inconvenience, was illustrated in one window by a colored "mammy," who performed the operations in a slip-shod manner. "Glooms" were scattered about the window, the large card stating "gloom filled every wash day with hard labor, aches and pains until Gainaday transformed it into—see other window for your answer." Then came the contrast, for in the other window joy in washing was typified, which, as the card stated, "reigns supreme if you own a Gainaday. No more hard work; just turn the handle and this wonderful servant does the rest." A lady demonstrator was obtained from the manufacturers of the machine, and performed the actual operations in doing a washing, displaying cards which explained the successive processes in their order. These were very similar to those given in the newspaper advertisements, and serves as an illustration of the efforts made to link the window display as closely as possible to the printed matter, enabling people who read the advertisements to come and see the operations actually performed. A number of other electrical appliances, including a range, vacuum cleaner and flatirons, formed part of the background of the exhibit in this window.

During the two weeks of the campaign 41 washing machines were sold, and the effects produced by the demonstration and advertising were so lasting that the remainder of the carload of 60 machines was disposed of during the two weeks following the close of the campaign. The company considers these results very gratifying and expresses the opinion that this is the largest number of electric washing-machines sold in the Northwest in the same period of time.

W. H. Vilett is manager of the Sterling Electric Company, which, besides electrical merchandising, does a general electrical contracting and jobbing business. M. V. Rutherford is the company's sales manager and the plans for the campaign, including the preparation of window displays and copy for advertising, were under his immediate direction.

See This Washing Demonstration

By an Experienced Laundry Operator from the "GAINADAY" Factory.

UNTIL APRIL 1st a practical demonstration of modern washing methods will be given in our store by an experienced laundry operator. Every step in the Gainaday Electric Washing and Wringing Process will be shown under actual operation. Each day a limited number of Gainaday Electric Machines will be placed in Minneapolis homes on a small down payment of only $5.00.

$5.00 now saves $5.00 and brings you at once a

Gainaday Washer Wringer

Then small payments made from each month's saving in time, labor and wear and tear on your clothes will soon pay for this modern electric washer and wringer. Remember that by seeing this practical trial and giving us your order now you can save $5.00. Come in today—there is no time like the present to take this labor, time and and money-saving step.

No. 1 Putting the clothes in the washer after filling tub up to water line with boiling water and adding soap. All collar and wrist bands as well as any especially soiled parts should be well soaped.

No. 2 Turning on the electric current by means of a convenient lever, after the cover of the machine is in position.

No. 3 Starting the wringer after the washing machine has been running from 12 to 20 minutes. Wringer has a safety latch.

No. 4 Wringing the clothes into rinse water. Machine is then ready for the second batch of clothes.

No. 5 Swinging the three-position wringer into the second position. A small plunger quickly releases the wringer and holds it firmly in each position.

No. 6 Wringing the clothes from rinse water to the bluing water. Strong Indigo sparkles washer and wringer at the same time.

No. 7 Wringing the clothes from blue water to basket with the wringer in the third position. The next batch of clothes can now be taken through the same process.

Read These Advantages Now!

Then study the pictures opposite and you will more fully appreciate the significance of this unusual offer. Your maid's time saved is your time saved.

The "Gainaday" is a washer and wringer combined and is equipped with a ½ horse-power motor capable of operating them both at the same time. Built on the offset cylinder system it does its work well, quickly and with the least possible wear and tear on the clothes. All working parts are enclosed and oiled automatically. Copper tub, zinc cylinder and long bearings give greatest durability.

A sturdy wringer that swings into three positions, handy levers, and double-roll swivel casters make the "Gainaday" a household device of greatest convenience. The "Gainaday" is guaranteed for FIVE YEARS.

Remember Every GAINADAY Is Guaranteed for Five Years.

STERLING ELECTRIC COMPANY

23 South Fifth Street. Phones: [illegible] 2141

MINNEAPOLIS, MINN.

"Service and satisfaction with every transaction."

Half-Page Newspaper Announcement of Campaign.

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, J. C. Digby, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

California Section.—The Secretary has received a letter from the secretary of this section, in which he states that they held a splendid meeting on March 4, fifteen members attending, and four new members being taken in. Though the number does not sound large it is an excellent percentage, and when it is remembered that the members are widely separated (one traveling 235 miles to attend) it sets a standard for other sections.

The section had for an entertainment an exhibit of motion pictures of the Pittsfield and Schenectady works and processes of the General Electric Company, shown by courtesy of the company, as well as a consideration of the subject "Electricity on the Farm."

The section will hold its annual meeting on April 6. The new members elected were as folows:

J. A. Royster, Pacific Gas & Electric Company, Martinez, Cal.

A. V. Yowens, City Hall, Palo Alto, Cal.

L. Weirda, City Hall, Richmond, Cal.

F. White, Mt. Whitney Power Company, Visalia, Cal.

The Eastern Massachusetts Section held its monthly meeting on April 7 at the quarters of the Wire Department of Boston, by the courtesy of Commissioner Cole, with 25 members present.

Commissioner Cole exhibited the relics of a very interesting case of burn-out in flexible conduit, causing a burning through a lead gas-meter supply, and described the conditions, and the general matter of "equivalent copper conductivity" of flexible conduit was discussed at length.

The main subject for discussion was upon the running of 550-volt, three-phase power circuits in factories, conduit versus open wiring, and whether the operating switches should be open or closed in.

After a full discussion it was decided that conditions varied so much in individual cases that no hard and fast rule seemed advisable, but that the local inspector should have full power to require conduit, if it seemed best to him, and it was the opinion of the great majority that in such work conduit construction was amply superior in most cases to justify requiring it.

New York Section.—The Secretary is advised that the report of the annual meeting of the section is on the way, but has not received it in time to include it here.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

The following gentlemen have become members of the section:

Daniel J. Drummond, 3014 Snyder Avenue, Brooklyn, N. Y.

John L. Lowton, 3103 Snyder Avenue, Brooklyn, N. Y.

Charles Parker, 1557 East Forty-Fifth Street, Brooklyn, N. Y.

The two questions herewith are rather closely related, the first referring to the protection of a low-voltage transformer on a house secondary from surges due to lightning; the second referring to protection of the house secondary from surges due to the appliances on the transformer secondary (which is really a tertiary circuit from the street primaries).

Though not complicated they may be of interest, considering the approaching season—summer lightning on the one hand, and summer vacations for experimental wireless by high-school boys and other students.

Protection of Bell-Ringing Transformers.

Question 322. We have been troubled with bell-ringing transformers burning out during thunderstorms. Is there any simple and yet positive way of protecting these transformers against lightning?

Answer 1(E). I have never experienced difficulty from this cause. Our secondary lines are well protected by lightning arresters and our secondaries well grounded. I am inclined to the opinion that this is why I have had no difficulty.

Answer 2(U). I would suggest putting several convolutions of wire in each lead to the transformer.

Answer 3(R)*. No simple method occurs to me. A small lightning arrester might be procured and tried.

Answer 4(S)*. It has not happened in my territory.

Answer 5(F and G). The only thing we can suggest would be bridging a pair of condensers in series across the supply terminals of the transformer. These would probably absorb the current surge in the same manner as when used in wireless work.

Answer 6(A)*. I never heard of any positive way of keep-

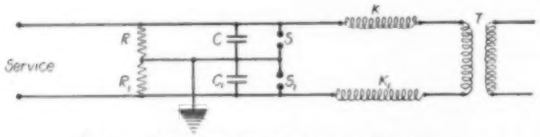
ing lightning out of such places. One might try lightning arresters between service switch and meter.

Answer 7(O). I know of no positive method of protecting transformers against lightning, but would suggest lightning arresters on the service wire; further safeguards would be properly grounding the service (rule 15) and running the wires within the building in iron conduit.

Answer 8(T). I am unable to give any information on this subject, as we have not experienced much trouble with bell-ringing transformers.

Answer 9(M). We are happy to state that we reside in a locality that has *never* experienced lightning or thunderstorms such as frequent other less favored communities, so would not venture an opinion on this question.

Answer 10(N)*. While I know of no actual case of such burning out and know of no positive way of protecting against lightning, I should protect just as I would my wireless transformer against "kick back." In the accompanying diagram, R, R_1 are 1,000-ohm graphite rods; C, C_1 are condensers of, say, 0.5 microfarad each; S, S_1 are two very close spark gaps; K, K_1 are a few turns of inductive reactance; T is the transformer. The condensers and gaps may be left in place all the time, but the resistances disconnected from the line (by having fuse plugs on each end which are normally removed) except when there is reason to expect lightning disturbance.



Wiring Diagram for Lightning Protection.

Condensers for Radio Apparatus.

Question 323. When two condensers are used across the line, as required by rule 86e for wireless telegraph apparatus, should they be connected to the electrical system of the building ahead of or behind the meter?

Answer 1(E). They should be between the meter and the wireless telegraph apparatus.

Answer 2(U). I should suppose as the supply company preferred.

Answer 3(R)*. They should be connected to the house side of the meter.

Answer 4(S)*. They should be on the load side of the meter. This is to protect the meter from the high-potential surges which might puncture insulation inside the meter.

Answer 5(F and G). Condensers should be placed between the meter and the wireless transformer.

Answer 6(A)*. On the load side of meter. I should not suppose any company would allow them to be placed elsewhere.

Answer 7(O). They really form part of the wireless set and should not only be connected behind the meter, but should be controlled by the branch fuse and switch which supplies the wireless equipment.

Answer 8(T). Between the wireless and the meter in order to give the latter proper protection from high-potential surges.

Answer 9(M). We believe the condensers referred to in Code rule 86*e* should be inserted in the line ahead of the meter.

Answer 10(N)*. They should be as close up to the wireless transformer as possible, practically forming a part of the apparatus.

The German Electrical Industry.

The hands employed in electrical industry in Germany are among those earning the highest wages, and a wage of one mark per hour is by no means of rare occurrence, while the pay is almost continuously rising. Another distinctive feature is the great number of officials, both in the technical and the commercial departments. The profits of the business are influenced by the keen home competition, as well as the competition on the world's market. In this connection it may be mentioned that during the five years, 1907-8 to 1911-12, the annual revenue of forty-five firms in the electrotechnical industry, reckoned as per cent of the share capital and the genuine reserves, receded from 8.70 to 7.74 per cent, whereas the revenue of the electricity works (89 works) during the same period, rose from 8.50 to 9.99 per cent. The aggregate dividends of the share capital in the two branches naturally show a similar, though not so pronounced movement. The following table contains some interesting statistics for the year 1911-12 about the electrical concerns, as against the total German limited companies:

	All Companies.	Electrotechnical Industry.	Electricity Works.
Number of companies	4,712	45	89
	Marks	Marks	Marks
Share capital entitled to dividends	14,550,281,000	231,995,000	689,863,000
Genuine reserves	3,515,432,000	45,101,000	120,054,000
Total capital	18,065,713,000	277,096,000	809,917,000
Debentures	3,499,947,000	90,181,000	469,512,000
Hypothecated	1,438,984,000	6,020,000	18,387,000
Annual revenue	1,470,520,000	21,450,000	80,934,000
Aggregate dividends	1,220,930,000	17,378,000	63,005,000

The following table shows the continuous increase in the number of concerns and hands employed in the "fine mechanics" and electrotechnical branches:

Year.	Number of Concerns.	Increase per Year in per cent.	Insured Full Hands. Total Number.	Increase and Decrease per Year in per cent.	Wages. Aggregate.	Average Wage per Hand.
					Marks	Marks
1898	1,652	—	46,555	—	50,703,000	1,089.10
1899	1,825	10.5	54,928	17.9	60,890,000	1,108.54
1900	2,017	10.5	61,578	12.1	68,964,000	1,119.98
1901	2,168	7.5	59,010	— 4.2	69,503,000	1,177.82
1902	2,261	4.3	53,809	— 8.8	63,839,000	1,186.40
1903	2,331	3.1	60,006	11.4	71,362,000	1,189.26
1904	2,481	6.4	68,385	14.0	82,169,000	1,201.56
1905	2,718	7.6	82,510	20.3	102,264,000	1,239.41
1906	2,982	9.7	94,472	14.5	121,352,000	1,284.53
1907	3,241	8.7	100,966	10.7	146,919,000	1,455.13
1908	3,475	7.2	108,472	7.4	158,516,000	1,461.35
1909	3,777	8.7	119,395	10.1	172,836,000	1,447.60
1910	4,101	8.6	142,535	19.4	212,113,000	1,488.15
1911	4,587	11.9	169,123	18.7	254,670,000	1,505.83
1912	5,082	11.7	192,714	13.9	298,348,000	1,548.14

The total figure for workmen in 1912 comprises 9,655 workmen employed at electricity works, and 43,587 hands employed in installation, etc., leaving about 138,000 hands for the actual manufacturing industry. From the year 1900 to 1912 the average wage per hand (male and female) per annum has thus risen from 1,120 marks to 1,548 marks, or, about 40 per cent.

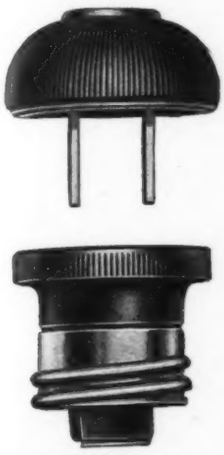
Compared with other leading industries, the electrical industry shows decidedly the greatest amount of development of any. There was an increase of concerns of 315 per cent, and an increase in the number of hands employed of 411 per cent. Leaving out the electricity works, the figures are, respectively, 225 and 385 per cent, while the corresponding figures for the branch which comes next, machinery and apparatus, are only respectively 57 and 102 per cent.—*Engineering.*

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Cutler-Hammer Standard Separable Attachment Plug.

Several electrical manufacturers have agreed on the making of standard plugs and receptacles, the caps and bodies of the various makes of which can be interchanged. This is proving beneficial and convenient both to those in the electrical industry and to the public. The C-H No. 7700 is the new standard type separable plug made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This is an all-composition plug, small in size, but having the rating of 660 watts, 250 volts. The accompanying illustration is approximately full size.



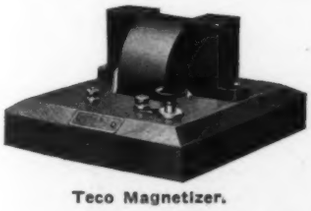
C-H Standard Separable Plug.

The knurled cap does not wear shiny when used, nor show the results of scratches; in fact, it is claimed that the appearance of the knurled cap improves with use, and since the cap is the portion of the plug that shows when in service this is of considerable importance. The contact blades are securely riveted to the cap and held in perfect alinement. No screws whatever are used, except those provided for securing the cord terminals. The live parts are entirely concealed.

Magnetizer for Remagnetizing Magneto Magnets.

All those familiar with the operation of gasoline automobiles know that ignition troubles are very frequently caused by defects or weakness of the magneto. Experienced garage and repair men state that fully 75 per cent of ignition troubles originate from weak magnetos.

To solve this difficulty there has been placed on the market by the Tritt Electric Company, Union City, Ind., what is known as the Teco magnetizer or magnet charger. As shown in the accompanying illustration, this is a compact little magnetizing coil which can be energized from any ordinary six-volt ignition or lighting storage battery, or from five or six ordinary dry cells, or any other low-voltage direct current. The device has no moving parts and nothing that may get out of order. The pole pieces are of liberal dimensions and arranged for convenient magnetizing of the magnets. It is said that with a fully charged 60-ampere-hour storage battery it is possible to fully remagnetize from 75 to 100 magnetos. Therefore, it should be possible with a device of this kind to handle many of the troubles that automobilists are continually meeting and an equipment of this kind should be especially serviceable in garages and repair shops.

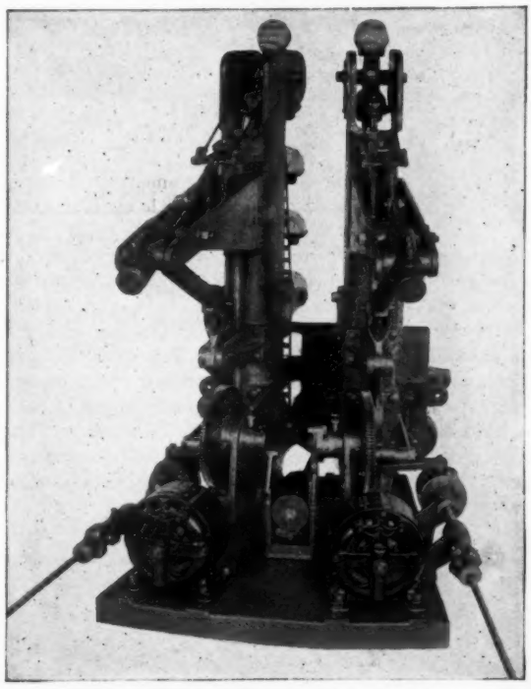


Teco Magnetizer.

Automatic Baseball Game with Electric Pitcher.

Amusement devices for the American people are without number. New ones are continually being developed. One of the cleverest means for recreation is the unique automatic baseball game manufactured by the Automatic Baseball Company, Marquette Building, Chicago, Ill.

Baseball is the national game of Americans as well as a most fascinating sport to both spectator and player alike. Persons from all walks of life and of all ages are its devotees. Its most attractive features are the batting and the scoring, and these are features supplied by the automatic baseball game.

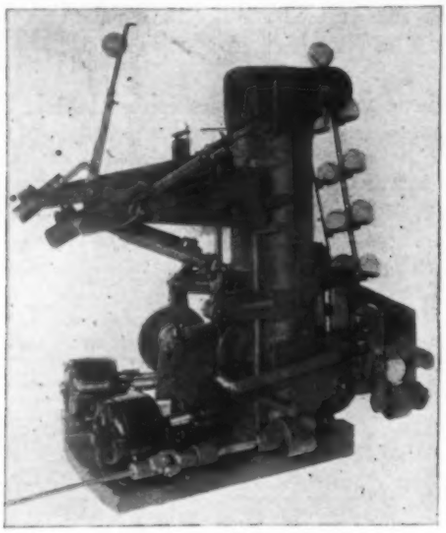


Front View of Duplex Electric Pitching Machine.

With this game, regulation baseballs and bats are used. Two batters can play at the same time. The machine itself can be adjusted for speed, slow balls, hooks and fadeaways, and even the emery ball. The game is played within a screen-inclosed court. The batter stands at one end of the court waiting for the ball to be thrown by the machine provided for that purpose. The object of the game is to so hit the ball that it will strike against a score board at the opposite end of the court to the batter. A record is kept of the performance of the batter according to whether the ball hits the score board on space marked first, second or third base, or home run. Thus the game is not only attractive but is one of skill. It furnishes good training and splendid exercise for the player. An attendant in front of the court acts as starter, stopper, umpire and score keeper.

The machine for throwing the balls operates in the fol-

lowing manner: The ball is carried up to the top of the machine, or pitcher, by a conveyor or chain. A spring-actuated arm falls into position to receive the ball. The ball is released and is engaged in the grooves at the end of the arm. The arm then returns to an upright position in readiness to throw the ball. The throwing is controlled by an attendant, by means of a push button.



Side View of Electric Pitcher.

Westinghouse one-quarter and one-third-horsepower motors are used to drive this machine. The standard double court and batting gallery requires space 19 to 24 feet wide, and 60 to 85 feet long, and 10 to 16 feet high. The single court and gallery is about half the width. The cost of the installation is borne by the lessee and varies according to his fancy. Detail instructions for installing are furnished with each equipment, so anyone can set up the device without difficulty. If desired, the company will furnish, at an additional charge, a competent man to direct the installation.

The automatic baseball game is not sold, but the game and equipment with the right to operate it in a specified territory is leased for a term of years. The automatic baseball game is a big money-maker and in many instances the first cost of the investment has been paid in a few weeks' run.

Direct-Reading Portable Ohmmeter.

A line of instruments especially designed for use in the testing of railroad signal systems has been placed on the market by the Roller-Smith Company, 203 Broadway, New York City. This line of instruments includes several combination voltmeter and ammeter instruments of the direct-current and alternating-current types. Each of these is provided with a number of scales and is conveniently put up for portable testing use.

Another instrument in this line is the portable direct-reading ohmmeter, which is illustrated herewith. This instrument is a modified form of the portable Roller-Smith ohmmeter which has been on the market for some years and has been giving excellent satisfaction for various purposes. The new instrument is arranged in the form of a slide-wire bridge with self-contained galvanometer of rugged design but high sensibility; the set also includes a self-contained dry battery of several cells arranged for easy renewal, also a galvanometer key, stylus and several standard resistances. It is made in compact form and mounted in a polished hardwood case with hinged top and leather handle.

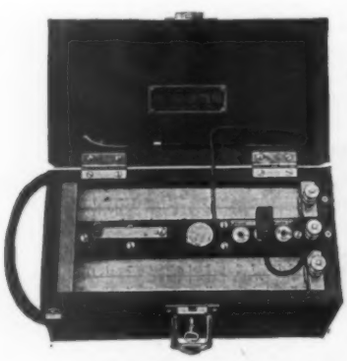
The instrument has three ranges, namely, 0-1, 0-10 and 0-100 ohms. Each of these ranges is marked on a scale 15 inches long and each of them has a different color for ease in identification. In making a measurement, the unknown resistance is connected to the points XX. The plug is inserted in one of the sockets, blue, red or black, these corresponding to the colors of the three scales. The stylus is then tapped along the wire that runs from end to end of the scale. At that point corresponding to zero deflection in the galvanometer balance is obtained and the resistance read off directly from the scale, using the figures of the color corresponding to that of the socket into which the plug has been inserted. If this figure indicates that it is in the range of one of the other scales, a more accurate reading is made possible by merely changing the plug to another socket and repeating the test on the scale which is better adapted to the particular resistance measured.

These ohmmeters have been designed primarily for use in measuring the resistance of electric signaling systems, such as the resistance of relay points, etc. However, they are well adapted to other work within the range of the instrument.

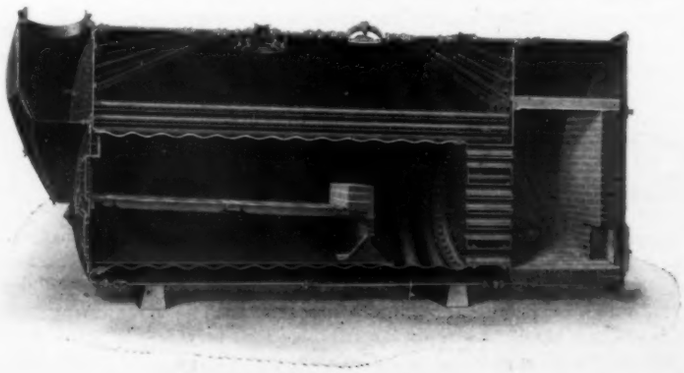
Duplex Internally Fired Boiler.

Although used mostly for marine work, the Scotch type of internally fired boiler is also employed to some extent in stationary boiler plants. An objection to the Scotch boiler, however, is that it has rather poor circulation in the lower part of the boiler. An ingenious improvement on the Scotch boiler, which retains its advantages and overcomes its defects, has recently been developed and placed on the market by the Murray Iron Works Company, Burlington, Iowa. This new boiler is known as the Duplex internally fired boiler and was patented August 24, 1915. A number of these boilers have been installed in electric light plants and have given exceptionally good results.

Like the Scotch boilers, these new boilers are very compact for their capacity, require no external brickwork nor elaborate foundations, and retain substantially all the heat developed in the internal furnace. The absence of outside brickwork eliminates the losses due to leaks therein. The Duplex boiler differs from the Scotch boiler chiefly in having a series of short hori-



Portable Ohmmeter.



Duplex Internally Fired Boiler.

zontal tubes between the rear head of the furnace and the combustion chamber. These tubes divert the flames downward so as to heat the rear and lower portions of the boiler. This results in a greatly improved circulation and also in increased capacity. The heated gases return through the long upper nest of tubes and pass up the smoke flue in front. A good idea of the general internal arrangement of the boiler is shown in the accompanying illustration.

It will be observed that the boiler has a cylindrical furnace with either corrugated surface, as shown, for the larger sizes, or plain cylindrical surface in the smaller sizes. The rear head and lower tubes in the furnace hold the heat where it must be imparted to useful heating surfaces; they also insure a more thorough mixing of the gases and thus promote improved combustion. Since the bottom as well as the upper part of the boiler are heated, the unequal expansion and contraction of the shell is eliminated.

Duplex internally fired boilers are made of the best materials and very carefully constructed by skilled workmen in a modern boiler shop. They are built in sizes from 8 to 250 horsepower and for pressures ranging from 100 to 200 pounds per square inch. In tests they have shown efficiencies as high as 88 per cent at practically rated load and based on the calorific value of the combustible.

Main Portable and Stationary Lighting Plants.

The demand for electric lighting on isolated farms and in rural houses has become so general as to call for equipments of various sizes and types. In some cases a very elaborate and large sized plant is required. In others the simplest possible and preferably small portable plant is called for. Between

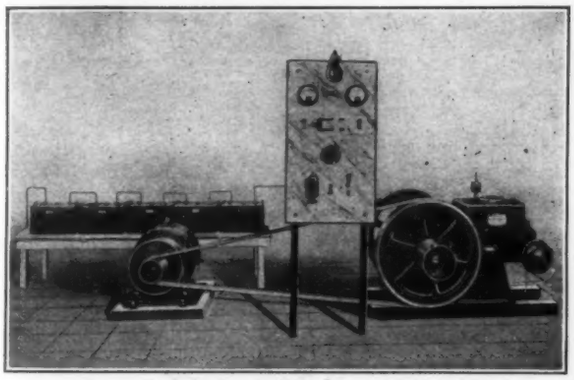


Fig. 1.—Main 0.75-Kilowatt Stationary Lighting Plant.

these extremes are a great variety of equipments that would especially fill requirements.

To meet these varied demands the Main Electric Manufacturing Company, 500-520 Aiken Avenue, Pittsburgh, Pa., has increased the number of sizes and types of lighting plants, the manufacture of which forms its exclusive business. A recent addition to its line is a small, portable, seven-light, 30-volt plant, which sells complete, as shown in Fig. 2, for only $69.95. It is necessary only to provide a gasoline engine, or to belt the outfit to any engine already on the premises. This plant includes a 40-volt, 175-watt dynamo, a 15-cell lead storage battery inclosed in rubber jars, and a simple form of slate folding-type switchboard. This entire set is mounted on skids and is shipped in completely wired and charged condition so that it can be set up for service in a very short time. This plant is intended only for very small country houses. Its rated load is seven 20-watt tungsten lamps. The battery capacity is 35 ampere-hours.

In Fig. 1 is shown a larger and stationary plant. This is rated as a 37-light plant. It includes a 0.75-kilowatt dynamo, 40-ampere-hour, 15-cell lead battery, blue Vermont switchboard, and 1.5-horsepower engine, all complete for $225. Larger engines and batteries are available for this same type of plant. Other plants of similar type are made for up to 1,000 twenty-watt lamps.

Fig. 2.—Main Seven-Light or Midget Lighting Plant.

Any of the standard Main plants can be furnished in the unit or portable type, such as that shown in Fig. 3. In this case, like the plant shown in Fig. 1, the set is shipped complete in one box, the switchboard folding up for this purpose. The wiring is complete and the plant may be quickly set up for immediate use. Although these plants were designed principally for use on farms, they also serve for any other purpose where 30-volt service is adaptable. Thus for lighting construction work, special display lighting, etc., where portability and ease of setting up the plant is an important feature, these plants have proven very serviceable. Although low in price, they are well built; the low cost is due to production on a large and economical scale.

New Resistance Alloy.

A new alloy intended to be used for electrical resistors has recently been patented. It consists of nickel, copper and chromium in the proportions of 70, 12.5 and 17.5, respectively. This alloy has a resistivity of 113 microhm-centimeters at 20 degrees centigrade and a temperature-coefficient of 0.000078 (per degree centigrade).

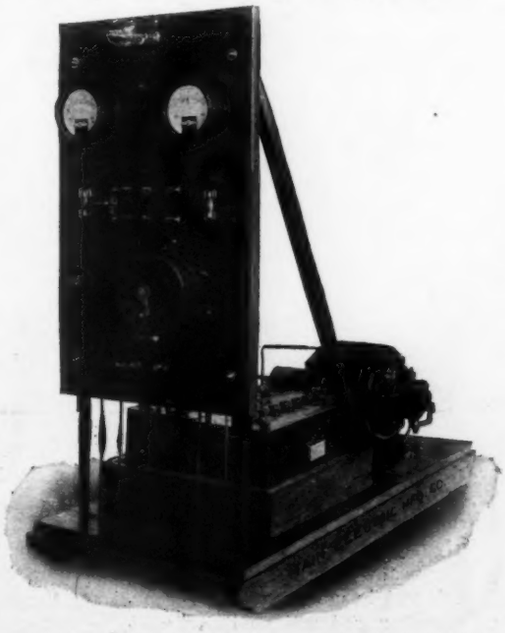


Fig. 3.—Typical Main Unit Type or Portable Lighting Set.

Electric Ranges Used Exclusively in a Detroit Apartment Building.

In several cities in the West it has come to be the vogue to equip large apartment buildings of the most up-to-date type with electric ranges throughout. As yet relatively little development of this kind has taken place in the eastern portion of the country. However, a large building under way in Detroit, known as the Boulevard Court, is to have an equipment of 36 electric ranges made by the Standard Electric Stove Company, Toledo, O. Naturally, the company is proud of this contract and when the matter was called to the attention of the Toledo newspapers, the Toledo *Times* made a feature article of it as being a distinctive Toledo achievement. A small reproduction of this article is shown in the accompanying illustration.

The ranges installed are of the type known as Model 600, a view of which is shown in the body of the article. Included in this type is an electric cooking compartment of the improved fireless-cooker type. It has heavily heat-

TOLEDO ELECTRIC STOVES ARE INVADING DETROIT

BOULEVARD COURT APARTMENTS ON WEST GRAND BOULEVARD, DETOIT.

Neighboring City to Install 36 Standard Ranges in a Single Flat Building.

Detroit is to be invaded by a battery of Made-in-Toledo electric ranges.

The Standard Electric Stove Company, of this city, has received the order and the 36 ranges of the newest type will be installed in the Boulevard Court apartments on West Grand Boulevard, Detroit, now in the course of construction.

Other bidders of large apartment houses in Detroit have taken notice of the installation and representatives of the Standard Stove Company say that it will not be long before a number of buildings there will have an electric range in each suite. One of these apartment buildings expects to install at least 66 ranges.

The owner of Boulevard Court is W. H. Stoger, of Detroit, who states that his total investment in over $150,000. The Standard ranges will be finished in bright royal blue enamel, which finish has distinguished this range for the past two years. It is a noticeable fact that there are no stove pipe or chimney connections to the kitchen and the use of electric ranges does away with all odors, smoke and all disagreeable features connected with open flame cooking.

The ranges to be installed are known as the model 600 Standard.

TYPE OF STOVE INSTALLED.

This particular type of range incorporates the new electric cooking compartment which is a great development over the old "fireless cooker." It also has the new automatic clock regulator attachment which enables a woman to put on her evening meal and go away and leave it knowing that the clock will automatically cut off the current when the food has been sufficiently cooked.

Mr. Stoger will guarantee the tenants of his new building that the total current bill for lighting, cooking and the use of electrical appliances will not exceed a very low maximum monthly. Each apartment will have its own meter. The suites will rent from $35 to $[illegible] per month, according to size.

The installation of the range in Detroit by the Toledo company is due to a letter written by Mrs. F. J. Ellsworth, of Buffalo, who lives in the Carlton apartment there, which has had 95 Standard Ranges in use for a year. She stated that she was going to move to Detroit and wanted to know if there was an apartment building there equipped with Standard electric ranges. The Toledo concern got busy with her letter and as a result she will be able to move in an electrically equipped apartment in the spring.

One Toledo family which will probably have one of the suites is that of Mr. Austin F. Bement, secretary of the Lincoln Highway Association, who now lives in Detroit.

Reproduction of Newspaper Article on Use of Standard Electric Stoves in Detroit.

insulated walls and includes an automatic clock-controlled regulator which enables the housewife to put in the food, turn on the current and leave it, knowing that the current will be automatically cut off at the proper time.

Acorn Electric Ranges with Sheathed-Wire Heating Units.

For over three-quarters of a century Rathbone, Sard & Company, of Albany, N. Y., and Aurora, Ill., have been manufacturing ranges for domestic uses.

In the early days wood was the only fuel used, later on the company's ranges were also adapted for the use of hard and soft coal, and in comparatively recent times the company has manufactured and sold thousands of ranges for burning both natural and artificial gas. Its enormous output

Fig. 1.—Acorn Type E-10 Electric Range.

has always been sold under the trade-mark name "Acorn" so that this name has become a household word.

This old established concern has now embarked in the manufacture of electric ranges for domestic use and has placed on the market a most attractive line consisting of six distinctive models. In designing these electric ranges the manufacturer followed, to a certain extent, the well established designs of gas ranges which have become so popular in recent years. The ranges have been developed to meet the requirements of the average kitchen and for the average family, the cooking top being of the right height, the right depth and not taking up too much room in the kitchen. The switches have been located conveniently with proper identification marks for each switch. The size and shapes of the ovens and broilers are such as to commend them to the most fastidious housekeeper. They are equipped with canopies, with high shelves, warming ovens, and in addition are beautifully embellished with white-porcelain-enamel door panels and splashers. The ovens are perfectly insulated. The framework is made of heavy angle iron which makes the

Fig. 2.—Acorn Type E-30 Electric Range.

range rigid, and all sheet-metal and cast-iron parts are handsomely enameled in black. The ranges have a liberal amount of nickel trimmings.

The Acorn line of electric ranges is equipped throughout with the General Electric sheathed-wire heating units. All the ovens are equipped with two heating units, one being in top for broiling and the other in the bottom for roasting and baking. The new sheathed-wire heating unit of the General Electric Company has been on the market and in steady operation for many months, proving altogether satisfactory. All oven units for baking are arranged for two heats. All cooking-top or hot-plate units are arranged for three heats. In addition a vegetable cooker with a capacity of three quarts, having all the advantages of a fireless cooker, may be substituted for hot plates.

The E-10 type of range shown in Fig. 1, is a standard type of range with oven 18 by 14 by 18 inches with two heating units. The space underneath the oven in this particular type is used as a warming oven and is not fitted with any heating units. In a similar type of range designated as E-20, this space is fitted with a standard heating unit for broiling.

The E-30 type, as shown in Fig. 2, is a most complete range, having an oven 18 by 14 by 18 inches, a broiler 18 by 10 by 18 inches and warming closet 18 by 10 by 18 inches. This range is also equipped with a canopy shelf.

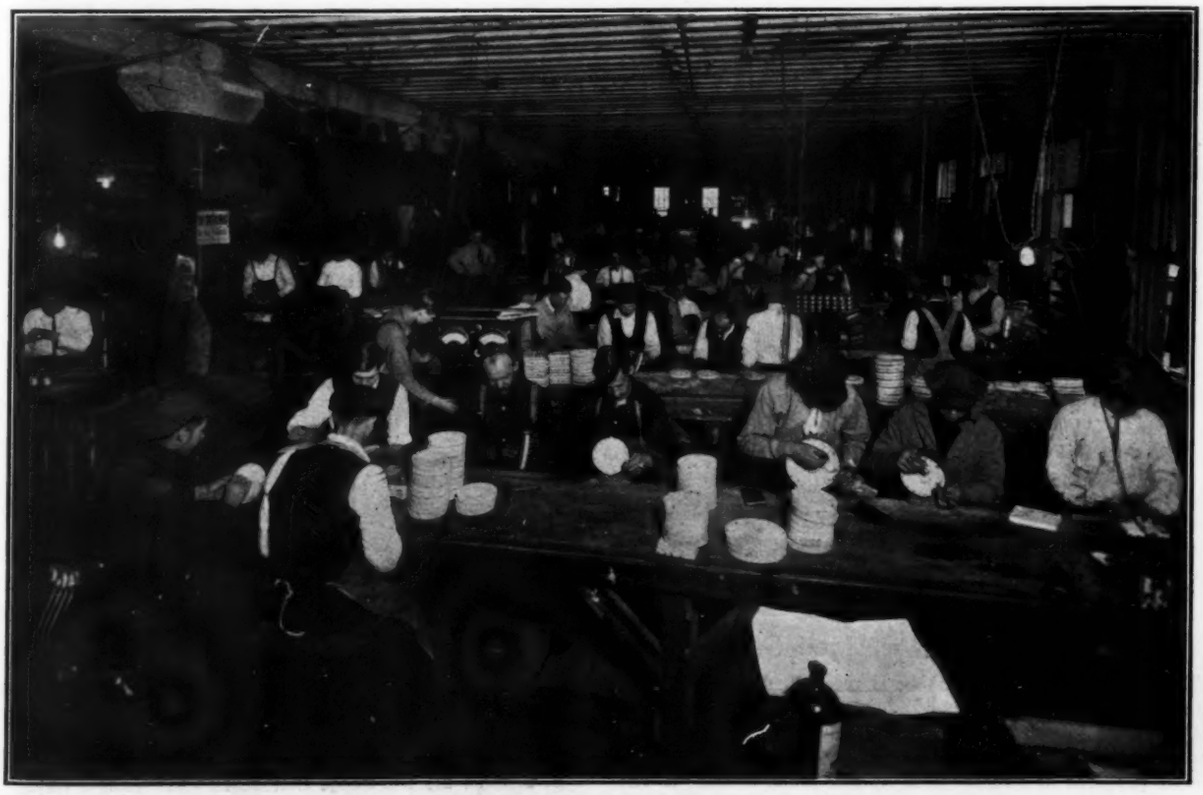
Each of the Acorn line of electric ranges is equipped with a thermometer in the oven door, which is of the safe type with positive latch. Altogether it makes up a most attractive line and well worth the consideration of central-station managers and all others interested in the exploitation of electric ranges.

Electric Range in the Hotel St. Regis.

One of the famous hotels in this country, noted particularly for the excellence of its cuisine, is the Hotel St. Regis in New York City. This hotel possesses one of the most beautiful, best arranged and best equipped kitchens to be found anywhere and in it is an array of electrical appliances, including a large range, an electric toaster, a salamander and broiler.

The range, a line diagram of which is on the next page, was furnished by the National Electric Utilities Corporation, 103 Park Avenue, New York City. This range is 8 feet 10 inches long, has three ovens, and five hot plates on the top, measuring 18 by 24 inches each, covering the entire cooking top of the range. Each oven and each hot plate is controlled by a separate three-heat switch. The high heat is for the purpose of producing the necessary temperature in a hurry, the medium or operating heat holds the temperature at the right point, and the low heat is for simmering purposes. The ovens and hot plates hold their heat fully an hour after the current is all turned off.

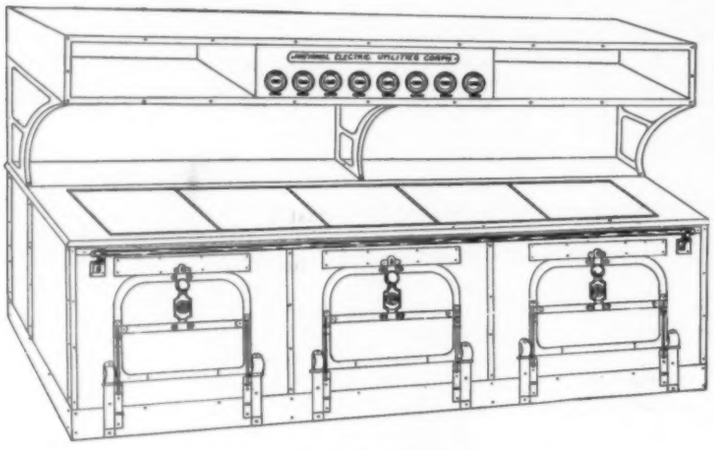
The results obtained by this range have been so satisfactory that the famous chef of the hotel, Emile Bailly, has become an enthusiastic advocate of electric cooking. He prefers to do roasting and baking by electricity because the oven has an evenly distributed heat which, under the switch control, can be quickly turned from intense heat to a very mild heat. In this way, when a roast is put in, the surface is evenly and quickly seared so that the juices in the meat or bird or other viand are retained. Not only that, but one does not have to keep turning the roast around to prevent it from being overbrowned or overcooked at any one point.



One of the Assembling Rooms of the Hughes Electric Range Factory in Chicago.

A tour through the plant of the Hughes Electric Heating Company, Chicago, Ill., reveals to the stranger many novel manufacturing processes, especially that by which the asbestos composition blocks, which form part of the range burner, are molded under the tremendous pressure of 4,000 pounds per square inch and baked for several hours. The illustration shows the heating-unit assembly section. In the foreground, the round white objects are the composition blocks, the faces of which have been deeply grooved and are now having the resistance wire inserted and securely fastened. These units are guaranteed for one year, but the resistance wire used by this manufacturer is so tough that it has averaged five years of heavy duty service under a variety of high temperatures. Note the testing board in the left center part of the picture. Here the resistance wire is tested for proper voltage and wattage before it is inserted into the block and becomes a burner, just as the completed range is tested before it is shipped as a perfect Hughes product. The Hughes company has electric ranges in service in all parts of the world.

The chef merely lets it remain, simply waiting to see that the cooking process has been compelted. Chef Bailly is also greatly pleased because of the absence of fumes and odors of any kind and there is therefore no need of large flues and special ventilating equipment. Since practically all of the heat is retained in the range, because of its heavily heat-insulated walls, the kitchen is never uncomfortably hot.



Neuco Electric Range in the Hotel St. Regis.

Mr. Bailly finds that the reason why electrically cooked food and electrically broiled steaks have such a superior flavor is because the food does not come in contact with gases caused by combustion, and one of the most important considerations is the fact that meats shrink very much less. For instance, if a 10-pound roast of beef is put into an ordinary oven there is only 7 pounds left when it is roasted, 30 per cent at least of the roast having been consumed, whereas the shrinkage in an electric oven is only 10 per cent. This shrinkage is composed of juices or the nutriment of the meat, and if it was all consumed in the cooking there would be nothing left but a hard, pulpy substance with no nutriment in it. In hotels and restaurants where cooking is done for large numbers of people, the saving in the shrinkage of food alone will almost pay for the cost of current used.

A flue is always necessary in a conventional range to carry off the gases due to combustion and therefore such ranges have an efficiency of 10 to 15 per cent, the remainder of the heat produced going up the flue or out into the room. An electric range, on the other hand, has no flue and has an efficiency of at least 85 per cent, not over 15 per cent going out into the room. That is why eelctric kitchens are cool, clean and sanitary.

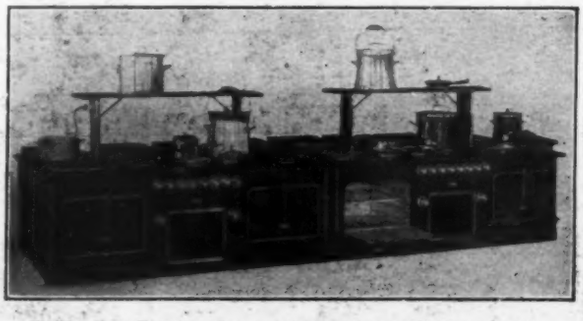
The National Electric Utilities Corporation, which furnished the range and appliances referred to, specializes in the making of heavy-duty electrical equipment of every sort —ranges, toasters, broilers, kettles, salamanders, hot plates, warmers, etc.—for hotels, restaurants, clubs and institutions. It has just completed a new factory at Danbury, Conn.

The Electric Range for Hotel Service.

The subject of electric cooking is receiving attention by all interested in the wholesome cooking of food and notably by the managers of hotels, restaurants, clubs and large institutions. An interesting article on the electric cooking range for such service appeared in a recent issue of *The Hotel World;* it was written by F. W. Hewitt, electrical engineer of the Simplex Electric Heating Company, Cambridge, Mass. Mr. Hewitt shows that this service is entirely distinct and has different requirements from ordinary domestic cooking. Consequently, manufacturers of electric ranges for such heavy service have felt that each case requires a design to specially meet its conditions.

It is generally recognized that the lowest operating cost can be obtained by using steam for low-temperature work and electricity for high-temperature work; that is, the vegetable steamers, soup kettles and hot-water supply will be taken care of by steam, and the electric range can do the baking, roasting, broiling, frying, griddling, etc. In analyzing such a problem as this, the designer lays out the range carefully so as to have nothing in the range that is overaccented and represents unnecessary investment of money and space. The results of the electric range when built for large kitchen work and where they have been designed along the lines outlined above, have been very satisfactory, and a hotel manager can purchase electric cooking equipment for his kitchen with full assurance that he will receive a reliable and durable device. The purchaser must, of course, satisfy himself that he is purchasing the range from a manufacturer who has had ample experience in this line.

Mr. Hewitt cites many advantages of electric ranges for such service, among them being labor saving, economy of space, accessibility, constancy and definiteness of heat supply, etc. Taking up a definite problem, he cites a large institution, which required a range to cook for about 1,500 inmates, the kitchen being so designed that the range could be placed out in the middle of the room; steam at about 20 pounds pressure was available for heating the water and for use in soup kettles and vegetable steamers. The cooking was done in large quantities but of simple nature. This requirement was well met by the Simplex range shown in the accompanying illustration. It was 15 feet long, and 5.5 feet wide, containing six ovens, each 21.5 inches wide, 27 inches deep, with 16 inches high clear working space. As you approach one side, the top is equipped with large disk stoves capable of receiving copper utensils of 15 gallons capacity, or thereabouts, with some smaller stoves suitable for cooking in smaller quantities. The other side of the range was equipped with large flat units about 18 by 24 inches in dimensions, which had raised rims. These devices are unique to electric cooking, but are very satisfactory for cooking in shallow fats, such as ham, eggs, etc. Provision is made so that portable devices can be attached conveniently to this range. Each device and each oven has a separate control switch, with three regulations, and there is ample capacity to take care of the requirements specified. The range itself is substantially made of steel, and years of service can reasonably be expected. This range is far larger than the average hotel range; in fact, is said to be the largest electric range ever built, but is representative of what can be done in this line.



A Simplex Electric Range that Cooks 4,500 Meals a Day.

The advantages of electricity from all points of view are such as to warrant the hotel manager making an investigation of his particular case, to see whether or not it is superior to the form of cooking that he is now using. Mr. Hewitt states that he knows of no case where an electric hotel range has ever been installed and has been replaced by the old method of cooking.

INDUSTRY ACTIVITIES

Ridgway Dynamo & Engine Company, Ridgway, Pa., has moved its office in Boston, Mass., to 420 Exchange Building, with A. R. Meek in charge.

Sangamo Electric Company, Springfield, Ill., recently has closed a contract with the City of Los Angeles, Cal., for supplying alternating-current meters to be used by the new municipal electric-lighting plant. The first order on this contract called for more than 7,000 meters and many thousand more probably will be required.

The Appleton Electric Company, 218 North Jefferson Street, Chicago, Ill., announces the removal of its office in New York City from 25 West Broadway to 67 Barclay Street, and its office in San Francisco from 680 Howard Street to 221 Second Street, the latter office remaining in charge of Keeler-White Company. The company's office in St. Louis is located at 917 Pine Street, instead of 1007 Pine Street, as announced in a previous issue, and is in charge of R. V. Hawkins.

Voss Brothers Manufacturing Company, Davenport, Iowa, has issued an attractive 40-page catalog on its line of washing machines. A number of styles of electrically operated combination washers and wringers are illustrated and described. These machines have a reversible wringer, operated both by hand-lever and foot-treadle control. The washer and wringer can be operated independently, and are driven by a specially designed motor.

National Coil Company, Lansing Mich., in order to meet the requirements imposed upon it by the large demands for its products, has found it necessary to employ a night force. The prospects for increasing business, due to the success of its small high-tension magneto, has caused anticipation of means to increase the plant capacity, and while no definite action has been taken, additional factory buildings are contemplated. With present orders a steady and increasing production will be needed for the next 12 months.

Lux Manufacturing Company, Hoboken, N. J., announces that Deuth & Company, Incorporated, of 131 East Twenty-third Street, New York City, has been appointed sales agent for Lux lamps for the district of Greater New York. F. R. May and Thomas M. Magiff, who have formerly had charge of this territory for the Lux Manufacturing Company, are now associated with Deuth & Company, and will together with the efficient force of the latter company, be able to give better attention to customers in that territory.

Bleadon-Dunn Company, of Chicago, Ill., manufacturer of the "Violetta" high-frequency generator for medical purposes, opened an agency in New York City. This agency is called the Violetta Company, located at 1182 Broadway, and is conducted by Abbott I. Werner. Trade in the New York territory will be handled from this office, which is opening under the most favorable auspices, with large orders coming in at the start, both domestic and foreign. The sales force is of high caliber and is ready to demonstrate the "Violetta" to those interested in this instrument which has opened up a new field for the electrical dealer and jobber.

Hotpoint Prize Essay Contest on Electric Cooking.—For more than ten years a large number of families in Ontario and Upland, Cal., have been cooking entirely with electric equipment manufactured by the Hotpoint Electric Heating Company, Ontario, Cal. To obtain an opinion from these housewives as to the satisfaction which they enjoyed from electric cooking, the Hotpoint company conducted a prize essay contest, which was open only to the housewives of Ontario and Upland and excluded Hotpoint employees or members of their families. The contest met with very enthusiastic reception and the essays submitted were much in excess of the number anticipated. The prize for the best essay was the choice of any one of the five models of electric ranges just being marketed by the Hotpoint company. The interest manifested was so great that the local power company has since made provision for range demonstration stores in both of the towns mentioned and for installing experienced demonstrators to talk the merits of electric cooking and electric ranges.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., recently brought out some very attractive literature describing its small electric lighting plants. The leaflets will be found to be excellent inserts for circular-letter campaigns carried on by electrical dealers and jobbers. Dealers will also find the 17 by 25-inch hanger very useful in window trimming, store decorating, and in display work. Rural communities, small towns, and outlying suburban districts where central-station service is not yet available are excellent fields for these outfits. The Westinghouse company is advertising these outfits extensively and is co-operating with the dealers in following up this advertising. Dealers interested in the apparatus are familiarized with its terms of sale, installation, operation and advantages.

Domestic Carbons Give Satisfactory Service.—A statement which has gained some credence in the trade is to the effect that since the supply of German arc-lamp carbons, especially flame carbons, has been seriously curtailed by the war, arc lamps have given poor operation with domestic carbons. A specific instance cited is that of the Penn Central Light & Power Company, of Altoona, Pa., quoted as being dissatisfied and about to discontinue the use of these lamps.

"A thorough investigation," says N. C. Cotabish, general sales manager of the National Carbon Company, "has proved that this statement is absolutely unfounded, and the superintendent, Forrest Cole, says he has been getting first-class service with American carbons in both alternating-current and direct-current lamps. Mr. Cole has been urged to replace his arc lamps with an incandescent installation, so has kept a complete record of his lamp operation for the past three years, amounting practically to a continuous test. While Mr. Cole is not publishing his actual cost figures, he is satisfied that he would gain nothing by a change of type. A summary of his outages due to all causes for the last three years amounts to exactly one-half of one per cent and he challenges any city using a different type of illuminant to show a better reliability figure. He has therefore definitely decided to stick to arc lamps. During this time he has used domestic carbons exclusively. Thousands of arc-lamp users all over the country have burned domestic carbons for many years without a complaint and there has been little or no dissatisfaction among those who switched to them after the outbreak of the war, so there need be no apprehension for the future. As a matter of fact, an almost negligible percentage of lighting carbons were ever imported into this country. The American manufacturers have always supplied the market, so it is obvious that any curtailment of the German supply can in no way cripple the industry."

Sales Campaign on Benjamin "92" Double-Duty Sockets

Representative Group of Dealers' Window Displays in Pittsburgh, Pa., Featuring Benjamin "92" Sockets

Dealers' helps furnished by the manufacturers are the essence of some merchandising campaigns. These helps form an attractive setting for the display of electrical appliances, secure the attention of the passers-by, and succeed in placing a large amount of electrical goods on the other side of the counter. The Benjamin Electric Manufacturing Company, Chicago, Ill., with an efficient line of dealers' helps, is one of the manufacturers that backs these individual helps with extensive advertising in the national periodicals. The above illustrations show a number of campaign drives in Pittsburgh that resulted in repeat orders in the effort to maintain the line.

PERSONAL AND BIOGRAPHICAL

MR. JOHN F. WARD, who recently became assistant manager of the Northwestern Electric Equipment Company, of St. Paul, Minn., is a native of Chicago, Ill. He received his education in Chicago public schools and at Armour Institute of Technology. In 1897 he entered the employ of the Western Electric Company, Chicago, where he received special training for sales work. He remained in the sales organization of that company for 19 years, in Chicago, St. Paul, and the last five years at Toronto, Canada. At the latter place Mr. Ward was district sales manager and left that position to return to St. Paul and assume his present position. While in Toronto Mr. Ward became a member of the Canadian Electric Association, Engineers' Club, Electrical Section of the Toronto Retail Merchants' Association and other organizations. He is now a Congressman in the

John F. Ward.

Jovian Order and a past Statesman. He was Reigning Chiron in the Fourteenth Jovian Congress.

MR. GARRET A. HOBART, JR., Paterson, N. J., has been elected a director of the Public Service Corporation of New Jersey.

MR. C. A. CALL, formerly in the advertising department of the General Electric Company, has been appointed manager of publicity for the Terry Steam Turbine Company, Hartford, Conn.

MR. CHESTER P. GROSS, who has been connected for some time with the Wisconsin Rate Commission, has been appointed superintendent of the municipal electric-lighting plant at Grand Rapids, Wis.

MR. JOHN W. DAY, formerly president and manager of the Duluth (Minn.) Electrical Company, which has discontinued business, has entered the employ of the Northern Electrical Company, of that city.

MR. WILLIAM L. GOODWIN, vice-president and sales manager of the Pacific States Electric Company, San Francisco, Cal., at a recent meeting of the Home Industry League in that city spoke on "The Attitude of the Federal Commission Toward Business Associations."

MR. W. R. ABBOTT, general manager of the Chicago Telephone Company, was elected president of the Industrial Club of Chicago last week.

MR. T. C. DUNCAN, superintendent of the light and telephone department of Prince Rupert, British Columbia, has resigned his position. He has not announced any definite plans for the future.

MR. A. C. WESTPHAL has been appointed superintendent of the plant of the Mandan (N. D.) Electric Light Company, succeeding MR. B. K. SKEELS. Mr. Westphal has been in charge of the municipal electric-lighting plant at Fergus Falls, Minn., for several years past.

MR. JAMES CLARK, JR., of Louisville, Ky., president of the James Clark, Jr., Electric Company, has been officially authorized to wear the title which is generally bestowed on Kentuckians. He is a "Colonel" in his own right now, having been appointed a member of Governor Stanley's staff.

MR. SAMUEL G. McMEEN, president of the Columbus Railway, Power & Light Company, and of the Ohio State Telephone Company, has been made chairman and secretary of a commission consisting of five Ohio associate members of the government's Naval Consulting Board. This commission was recently appointed and will conduct a state-wide industrial canvass bearing on military preparedness.

MR. W. G. MOORE, who until recently was manager of the Texas Power & Light Company, at Paris, Tex., has resigned to form a partnership known as Collins & Moore, consulting electrical engineers and contractors, of Paris. The new firm will, in addition to doing a general electrical and mechanical engineering and contracting business, handle a complete line of merchandise for both wholesale and retail trade. Mr. Moore is a native of Texas and well and favorably known in the Southwest. He was educated at the Agricultural Mechanical College of Texas, graduating from the college of electrical engineering in 1907. Previous to going with the Texas Power & Light Company, Mr. Moore was manager for Arnold & Wetherbee, electrical engineers and contractors, Oklahoma City, Okla.

MR. JOHN H. LUCAS, one of the oldest of the men associated with street railway and electric light companies in Kansas City, Mo., has been elected president of the Kansas City Light & Power Company. Mr. Lucas came to Kansas City and established a law office in 1879, the firm name being Johnson & Lucas. He early became identified with the legal department of the street railway company, becoming general counsel for the cable railway and later for other street railway organizations as consolidation was effected, being counsel for the Metropolitan Street Railway Company since 1902. When the Kansas City Electric Light Company was organized in 1884, he became counsel for that. He continued as legal adviser for both companies through the street railway receivership, handling the usual detail of legal work and assisting in the reorganization plans.

MR. E. E. RINES, who was recently appointed western sales manager of the Century Manufacturing Company, of Elizabethtown, Pa., manufacturer of electric displays, has established headquarters in Chicago, Ill., at 105 North Clark Street. Mr. Rines became identified with the electrical industry 34 years ago when he was employed at the Edison Machine Works, Schenectady, N. Y., the forerunner of the General Electric Company. He attended Cooper Institute and Columbia University and learned the three-wire system of distribution in a class taught by Thomas A. Edison. He remained with the Edison Works until 1889, installing many of the first lighting systems in the East, and came to Chicago, entering the employ of the old Chicago Edison Company and making many prominent wiring installations there. In 1903 Mr. Rines became a salesman for

E. E. Rines.

the Wesco Supply Company, St. Louis, Mo., remaining with that concern until 1908 when he became connected with the Federal Sign System, of Chicago, Ill., for which he did special work, installing signs and conducting sales campaigns. He remained with this company until he accepted his present position.

OBITUARY.

MR. CHARLES FOWLER BALDWIN, of Montclair, N. J., died in Pittsburgh, Pa., April 9, aged 41 years. He was a graduate of Kenyon College and Massachusetts Institute of Technology, class of 1897. Mr. Baldwin was associated with the Western Electric Company for 19 years, and served as chief engineer for that company in Antwerp and London.

MR. ARTHUR J. WALSH, manager of the Wisconsin Gas & Electric Company, died in Kenosha, Wis., April 11, aged 30 years. He received his early training in the public schools of New Richmond, Wis., and was graduated from the University of Wisconsin in 1906. Mr. Walsh was active in many organizations in Kenosha and was widely known among men of the electrical industry in Wisconsin.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

LISBON FALLS, ME.—A committee of citizens is investigating the establishment of a municipal electric-lighting plant.

SACO, ME.—Plans are being discussed to make extensions in the ornamental street-lighting system on York Hill.

HARDWICK, VT.—The municipal electric plant has signed contracts to supply electric service to the town of Greensboro.

TILTON, N. H.—Nitrogen-filled lamps will be substituted for the present arc lamps on the streets of this town, the Tilton Electric Light & Power Company supplying energy at $47.50 per year for 400-candlepower incandescents. The rate charged for the arcs has been $77.50. Professor H. E. Clifford, of Boston, has been retained to relocate the street lights in the best possible manner.

ACTON, MASS.—Plans are being made to install a new electric-lighting system here.

BECKET, MASS.—F. W. Munch, of Canaan, N. Y., has applied for a franchise to erect and operate an electric-lighting plant here.

MIDDLEBORO, MASS.—The municipal light plant of Middleboro is planning to extend its lines into the town of Lakeville, and has asked the Light Commission's approval.

MILFORD, MASS.—A contract for street lighting has been signed with the Milford Electric Light & Power Company, which includes the addition of about 300 lamps.

NORTH ADAMS, MASS.—The Adams Electric Light Company is making extensions to its distribution system here. Additional extensions are being considered by Manager B. K. Cook.

SALEM, MASS.—Electric wires on Bridge Street are to be placed underground by July 1.

NEW LONDON, CONN.—Contracts for a new ornamental lighting system on State Street will be signed in a few weeks.

THOMPSONVILLE, CONN.—The Northern Connecticut Light & Power Company will build a two-story addition to its present plant on Central Street. The first floor will be used as a show room for electric supplies, and the second floor will be used for the company's office. Some substation equipment will also be installed.

AMSTERDAM, N. Y.—Approval of a $400,000 bond issue of the Edison Electric Light & Power Company has been made by the Public Service Commission of the Second District. A small part of the issue will be used for extensions and betterments.

BATAVIA, N. Y.—Chester & Flemming, of Pittsburgh, Pa., are preparing plans for the rearrangements of the municipal electric-lighting plant.

BUFFALO, N. Y.—Plans for an ornamental lighting system on Genesee Street are being considered by G. E. Zeller and others.

CHATHAM, N. Y.—The Albany Southern Railroad Company, of Hudson, has signed a ten-year contract to supply energy to the Chatham Electric Light & Power Company, which operates the lighting system here. The work of constructing the transmission line between the former company's substation at Valatie and Chatham has been started. The Albany company is also seeking franchises to operate in the villages of Poestenkill, Averill Park, Defreestville and other towns in that vicinity.

EAST AURORA, N. Y.—Mayor Brotherhood has announced plans for installing a new electric street-lighting system here.

ELBRIDGE, N. Y.—The Jordan (N. Y.) Electric Light & Power Company has installed generating equipment here and is furnishing electric service.

GREEN ISLAND, N. Y.—A franchise has been granted to the Adirondack Electric Power Corporation to furnish electrical energy for power and light to consumers here. The franchise was objected to at first by residents here, but the objections have been removed since the company will not directly compete with the municipal electric lighting plant.

LEWISTON, N. Y.—The Sanborn-Pekin Electric Power Company has petitioned for the privilege of erecting an electric-lighting system here.

NEWARK, N. Y.—The Board of Directors of the Custodial Home for Feeble-Minded Women at Newark has returned the bids on alterations to the power plant and will readvertise the work. The action was taken because of an error in the bid of the R. T. Ford Company.

SANBORN, N. Y.—The Sanborn-Pekin Electric Power Company has petitioned for a franchise to build and operate an electric lighting plant here.

SKANEATELES, N. Y.—The application of the Niagara, Lockport & Ontario Power Company to extend its transmission lines in that city has been granted by the Public Service Commission.

WEST SENECA, N. Y.—At the regular meeting of the Town Board a petition was presented by taxpayers living between this village and Springbrook for the establishment of electric street-lighting district No. 3.

BAYONNE, N. J.—The Central Broadway Business Men's Association is considering the installation of a private electric power plant to furnish service for the proposed new street-lighting system on Broadway. Frank Davis is a member of the committee on the improvement.

BAYONNE, N. J.—The City Commission is negotiating with the Public Service Electric Company for a new five-year street-lighting contract. The company agrees to install an underground conduit system to cost $25,000 the first year, with extensions to cost $10,000 each year for ten years thereafter.

BELVIDERE, N. J.—The Board of Freeholders has granted a 50-year franchise to the Hackettstown Electric Light Company for the installation and operation of a light and power system.

BRIDGETON, N. J.—The local electric-lighting plant has been sold to the International Electric Company, which is controlled by the American Railways Company. Plans are being made to increase the size of the power plant here, and orders for some of the necessary equipment have already been placed. B. F. Hires, formerly superintendent of the Bridgeton Electric Company, has been appointed general manager for the South Jersey district of the new holding company.

LONG BRANCH, N. J.—The City Council is planning for the installation of a new street-lighting system in the business section.

MOUNTAIN LAKES, N. J.—The Borough Council will build an addition to the municipal pumping plant.

NEWARK, N. J.—In a report to the Board of Works, Fire Chief Paul J. Moore recommends the immediate installation of an underground conduit system for fire-alarm wires.

BOSWELL, PA.—Th Union Light, Heat & Power Company has petitioned the City Council for a franchise to furnish electrical energy for light and power here.

DILLSBURG, PA.—The Dillsburg Light, Heat & Power Company will extend its transmission lines to Wellsville, eight miles from here, to furnish light and power for that district.

CLARKSBURG, PA.—The Clarksburg Electric Company is preparing to extend its service to Norwood, Grasselli, Tinplate and Owens, resulting from the recent completion of its power plant in this city.

MILLERSBURG, PA.—The Millersburg Electric Light, Heat & Power Company has been purchased by Farley Gannett, consulting engineer, with offices in the Telegraph Building, Harrisburg. Mr. Gannett is planning to enlarge the plant and make a number of improvements.

NEW CASTLE, PA.—A new substation costing about $150,000, will be erected in this city by the Mahoning & Shenango Railway & Light Company. The substation will be of steel, concrete and brick and will take the place of the present building. It will be used to transform the energy from the Lowellville plant, the new substation to have three times the capacity of the old one.

MINERAL, VA.—The question of issuing bonds for the purpose of establishing an electric-lighting and water system here will be submitted to vote April 25.

SPARTANBURG, S. C.—The Southern Railway Company, W. H. Wells, chief engineer, Washington, D. C., will build substations at Spartanburg and Central, S. C., and Cornelia, Ga., and generating machinery will be installed in the power house at Greenville, S. C., for operating automatic block signals and lighting stations between Spartanburg and Central, and Cornelia and Gainesville. Each substation will have a capacity of about 30 kilowatts and will supply energy at 4,400 volts, three-phase, 60-cycle.

SUMMERVILLE, S. C.—The holdings of the Summerville Ice & Power Company have been sold to the Carolina Central Electric Company for a reported consideration of $50,000. The purchasing company is interested in a number of lighting plants in this state, and it is reported that plans are being made to enlarge the Summerville plant.

ATLANTA, GA.—Details of the route of the trolley line to Emory University were announced by the Georgia Railway & Power Company in applications for a franchise. Work will be begun as soon as the franchises are granted and material obtained. The extension will be about three miles long.

LAKE HAMILTON, FLA.—E. C. Stuart, of Bartow, Fla., contemplates establishing an electric light and power plant here.

OCALA, FLA.—Benjamin Thompson, of Tampa, contracting engineer, has been awarded the contract to build and equip the new Ocala power plant and pumping station. The Council accepted Mr. Thompson's blanket bid of $98,000 for the plant complete, except the water tank and tower.

TAMPA, FLA.—The Tampa Electric Company has asked the County Commissioners for a franchise to build and operate lines of railway and extend its lighting system into a number of subdivisions adjacent to the city.

TAMPA, FLA.—Representing capitalists in the Middle West who will invest $1,000,000 to build an interurban trolley line between this city and Lakeland, by way of Plant City, E. J. Binford, who has been here for several months working on the project, has asked the Board of County Commissioners to grant a franchise.

NORTH CENTRAL STATES.

COLUMBUS, O.—E. R. Sharp, vice-president and treasurer of the Sciota Valley Traction Company, gives out the information that his company will build a terminal station here this summer, which will represent an investment of $800,000. The site was secured a year or two ago, being bounded by four streets in a central location. The architect's plans will be ready for figures within the next thirty days.

CANFIELD, O.—An electric-lighting system probably will be installed here in the near future. Energy will be secured from the Mahoning and Shenango Railway & Light Company, of Youngstown.

DAYTON, O.—The Dayton Power & Light Company has petitioned the State Public Utilities Commission for authority to issue $1,250,000 five-per-cent mortgage bonds, the proceeds to be used in making plant additions and betterments.

MANSFIELD, O.—Extensive improvements are to be made by the Mansfield Light & Power Company. A new power plant, which will ultimately cost about $500,000, is expected to be completed for operation by early fall. The company is a subsidiary of the Cities Service Company, of New York.

OTTAWA, O.—Plans for the establishment of a municipal electric-lighting plant are being discussed here.

HAMILTON, O.—The Park Board is planning to install an ornamental electric-lighting system in the city parks.

COLUMBUS, IND.—Citizens of East Columbus are planning to incorporate and establish a municipal electric-lighting system.

PERU, IND.—Manager Herren, of the electric light department has made a requisition to the City Council for a carload of poles to be used in re-establishing the city electric-distribution system.

ROACHDALE, IND.—The Roachdale Electric Company has been incorporated with a capital of $50,000 by R. F. Edwards, Harvey Chastain and G. E. Turner.

CLARKSTON, MICH.—Arrangements are being made for the establishment of a street-lighting system here.

BELOIT, WIS.—Work has been started on a large addition to the main west side power plant of Fairbanks, Morse & Company, making possible the housing of the entire equipment in one building. The capacity of the plant will be increased 1,000 horsepower and will be 3,000 horsepower when completed.

CHATFIELD, MINN.—The Chatfield Electric Light & Power Company has been granted a new franchise which will extend over a period of 21 years.

FERGUS FALLS, MINN.—The Otter Tail Power Company, C. B. Kidder, general manager, is planning to build a transmission line to Wilmot this summer.

FISHER, MINN.—The Red River Power Company, of Grand Forks, N. D., has been granted a franchise to operate a street-lighting system here.

NEW ULM, MINN.—Plans are being made by A. J. Mueller, superintendent of the municipal electric-lighting plant, for making repairs and extensions to the switchboard, estimated to cost $7,000.

SAUK CENTER, MINN.—City officials are planning to install a new system of gas-filled lamps for street lighting.

THIEF RIVER FALLS, MINN.—The question of issuing bonds for the purpose of providing extensions to the municipal electric-lighting and water systems will be decided at an election to be held soon.

BELLEVUE, IOWA.—Bonds in the sum of $1,000 have been voted to provide for improvements to the municipal power plant.

IOWA CITY, IOWA.—The Iowa City Light & Power Company is increasing and improving the equipment of its plant at Coralville, by the installation of 400-kilowatt additional generating capacity, together with exciters, protecting and controlling devices, new switchboard and other auxiliary apparatus.

LOCKBRIDGE, IOWA.—The Lockbridge Light & Power Company has been incorporated with a capital of $5,000 by Ralph Torrance and P. A. Coleson, to furnish electric service here.

QUASQUETON, IOWA.—J. L. Cross has been granted a franchise to construct and operate an electric-lighting plant here. He has an option on a water-power site, and will build a hydroelectric plant. A transmission line will be erected from this city to Walker.

EMMA, MO.—Charles Derking and others are interested in the construction of a transmission line from Sweet Springs (Mo.) municipal plant to furnish light and power to this city.

ENSIGN, KANS.—An electric-lighting plant is being installed in the Sutton garage. Service will be furnished for the Sutton Block and for residential lighting.

FORD, KANS.—Bonds have been voted for the establishment of an electric-lighting system here.

PRATT, KANS.—The City Commissioners have closed a contract to furnish energy from the municipal plant to the town of Preston for electric lighting. Coats, another small town near here, is also planning to make similar arrangements with local authorities.

NORTON, KANS.—The city is considering a proposition of entering into contracts to furnish energy for electric lighting for Lenora and Nocatur, two small towns near here, that are plannng to get electric service. Energy would be supplied from the municipal plant here.

GRAND ISLAND, NEB.—The Central Power Company, in order to rush the construction work on its hydroelectric plant at Boelus, has put on an increased force of men.

FAIRBURY, NEB.—The towns of Plymouth, Daykin and Western are considering a plan to secure energy from the local municipal plant for electric-lighting systems in the three towns. Superintendent Myers, of the municipal plant, has suggested the erection of a main transmission line ten miles north from Fairbury for the purpose.

HURON, S. D.—Petitions are being circulated by the business men on Wisconsin Street asking that the City Commissioners order an extension of the five-cluster ornamental lighting system which is used on the other business streets in this city.

MARION, S. D.—Work has commenced on the construction of the new electric-lighting system for this city. Foundations for the power house also have been commenced.

GRAND FORKS, N. D.—Extension of the transmission lines for distribution of power obtained from the hydroelectric plant at Crookston, Minn., controlled by the Bylesby interests, is being considered, and proposals have been placed before officials in a number of North Dakota towns north from Grand Forks.

DATES AHEAD.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

HOPKINSVILLE, KY.—The Kentucky Public Service Company, which operates electric power plants at Hopkinsville, Owensboro, Bowling Green and Frankfort, in Kentucky, and Clarksville, Tenn., is recording a $2,000,000 mortgage on its properties. The company is preparing to supply Guthrie with energy for light and power.

LEXINGTON, KY.—The City Council is preparing plans for the installation of a municipal electric-lighting plant.

PEMBROKE, KY.—S. G. Ragsdale, general manager of the South Kentucky Power Company, has made the announcement that his company has secured franchises for electric-lighting systems at Elkton, Adairville, Auburn, Lewisburg and Franklin, in Kentucky, and Adams, Cedar Hill and Portland, in Tennessee.

MAYFIELD, KY.—The Mayfield Water & Light Company, which has been in receivership, has been restored to its owners by the Circuit Court, and the company has elected D. B. Stanfield president and Ed Gardner general manager. The company will make some improvements, among which will be the installation of meters for all consumers.

BIRMINGHAM, ALA.—The city has asked the Birmingham Railway, Light & Power Company to replace all arc lamps with tungsten lamps.

BIRMINGHAM, ALA.—The Alabama Power Company is preparing plans to more than double the capacity of its substation at Anniston, Ala.

BIRMINGHAM, ALA.—The Board of Commissioners voted to call an election for June 5 to pass upon a bond issue of $500,000 for converting the North Birmingham lighting plant into a municipal plant for the whole city. Julian Kendrick, city engineer, has prepared plans for the improvements.

CHATTANOOGA, TENN.—The Chattanooga Aseptic Cotton Company is having plans drawn for a factory building to replace the plant which was destroyed by fire. Electric drive will be used throughout the new plant. Clarence T. Jones is the architect.

COVINGTON, TENN.—R. H. Green and others are making plans to establish a hydroelectric plant to furnish service here.

MURFREESBORO, TENN.—The Murfreesboro Electric Light & Gas Company has been sold by Davis & Elam to J. C. Beesley, George Beesley and J. M. and John Butler, for a reported consideration of $65,000. The new owners promise a rate of 7 cents per kilowatt-hour, a material reduction of the present rates. Some improvements will be made.

NEW TAZEWELL, TENN.—J. W. Rose and M. B. Carr, of Tazewell, have under consideration the removal of the lighting and power company's plant to New Tazewell.

HUNTSVILLE, ARK.—M. L. Shuster has new generating equipment and this city will now have permanent lighting service.

BLACKWELL, OKLA.—The issuance of $10,000 in bonds for extensions to the municipal electric-lighting plant and distribution system is being considered by voters here this week.

DALLAS, TEX.—The City Commission is considering plans for the building of a municipal electric-lighting plant, to cost about $500,000.

KAUFMAN, TEX.—The Texas Light & Power Company is extending its high-tension transmission line to Kaufman, and will sell energy to the Kaufman Light Company.

M'ALESTER, OKLA.—The Choctaw Railway & Lighting Company, which has been sold to C. M. Mason, chairman of the bondholders' protective committee, of New York, for $450,000, will be equipped with new machinery and improved in other respects.

WESTERN STATES.

FROID, MONT.—S. J. Dorothy and others are interested in a plant to establish an electric-lighting plant here.

HINSDALE, MONT.—The town of Hinsdale recently petitioned the Valley County Commissioners for the establishment of a special electric-lighting and water district. The cost of the entire project is placed at $27,700. Protests against the creation of the district will be heard at Glasgow, May 2.

HYSHAM, MONT.—The town has voted for water and electric-lighting bonds, according to reports. Mayor Lyndes states that the construction of both systems will be started early this summer.

CLOVIS, N. M.—Bonds in the sum of $35,000 have been voted for improvements to the municipal electric-lighting and water systems.

SANTA FE, N. M.—The Rio Grande Light, Heat & Power Company, C. G. Wilfong, president, has filed with State Engineer French the estimated cost of a proposed hydroelectric development at the mouth of the White Rock canyon of the Rio Grande.

SILVER CITY, N. M.—Orders have been issued for the establishment of an underground telephone system at Fort Bayard. Assistant Electric Engineer W. S. McDonald has been assigned to do the work.

PRICE, UTAH.—A special election will be held May 15 to submit the proposition of selling the municipal electric-lighting plant, valued at $50,000.

SALT LAKE CITY, UTAH.—Announcement has been made that the Utah Power & Light Company has taken over what is known as the church power plant, which supplies the electricity for the Temple Block, the Hotel Utah, Deseret News Building and several business blocks in the immediate vicinity. The plant was purchased from the Mormon Church.

HAILEY, IDAHO.—The Silver Creek Power Company has applied to the Public Utilities Commission for authority to install an electric-lighting plant to serve the residents of Carey and Picabo. It is planned to erect a power plant costing about $8,000.

WALLACE, IDAHO.—The City Council has granted a right-of-way through the city to the Washington Water Power Company, which is preparing to construct a power line to the mines up Placer Creek.

ELMA, WASH.—According to reports, the Northwest Electric & Waterworks Company, of Montesano, Wash., has purchased the Elma (Wash.) Light & Power Company's plant. Both the Northwest and the Elma companies have franchises to operate in Gray's Harbor County.

SPOKANE, WASH.—The Spokane Traction Company has applied for a franchise to operate a street car line on Grand Boulevard between Thirty-third and Thirty-eighth Avenues.

BAKER, ORE.—Business men and property owners have been asked by the Commercial Club and the City Commisioners to assist in financing the installation of cluster lights on certain streets here.

COTTAGE GROVE, ORE.—The General Electric Company, of Portland, according to reports, has signed orders for several thousand dollars' worth of electrical equipment, to be installed in a mine owned by the Black Butte Quicksilver Mining Company near here.

OREGON CITY, ORE.—The Rasmussen-Grace Company, of Portland, has been commissioned to prepare plans and specifications for the construction of the power plant for the new mill of the Hawley Pulp & Paper Company, which is to be erected below the Willamette Falls in Oregon City. Construction work will start in June.

WESTLAKE, ORE.—It is reported that a large electric power plant will be constructed between Westlake and Clear Lake by W. G. Campbell, of Westlake.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded a contract by the Board of Supervisors for street lights in the Sherman Lighting District.

LOS ANGELES, CAL.—Sealed proposals will be opened in the Supervising Architect's Office, Washington, D. C., May 8, for a vacuum cleaning machine for the United States postoffice and courthouse in Los Angeles.

LOS ANGELES, CAL.—An expenditure of $50,000 has been authorized by the directors of the San Joaquin Light & Power Company for the completion of power house No. 2 in Crane Valley, upon which approximately $250,000 was spent three years ago. It is located a mile and a half south of North Fork, and will utilize the fall of water between power houses No. 1 and No. 3. The new plant will develop 3,000 kilowatts, as compared with 18,000 kilowatts developed by power house No. 1 and 2,000 kilowatts developed by No. 3.

MARTINEZ, CAL.—The Martinez & Concord Interurban Railway Company has filed with the Railroad Commission an application for authority to issue 1,050 shares of its common stock at not less than $45 a share; $125,000 face value of its first-mortgage bonds at not less than $90, and $125,000 of its cumulative participating bonds at not less than par. These shares are to be issued only as an equivalent amount of first-mortgage bonds are paid and canceled. The company proposes to locate its main line along Escobar Street and Payton Road, to the easterly limits of Martinez, thence to a connection with the Oakland, Antioch & Eastern Railway and the Bay Point & Clayton Railway at Government ranch, two miles south of Bay Point and three miles north of Concord. The total length of the proposed line is 6.5 miles.

NEEDLES, CAL.—The Board of Trustees has approved an ordinance granting to the Needles Gas & Electric Company the right to construct and operate for a period of years electric, telephone and gas systems in this city.

PASADENA, CAL.—The City Commissions has called for bids for $15,000 worth of extra equipment for the municipal light and power plant.

SAN FRANCISCO, CAL.—A joint pole agreement is under consideration by city officials and the electric light, power, telephone and telegraph companies and other corporations that maintain poles and overhead wires in this city, where at present each company has its own poles.

SAN FRANCISCO, CAL.—Contracts have been awarded by the Great Western Power Company for the construction of a large class A substation, to be erected on property on the north side of Bush Street and Grant Avenue. The building will have an area of 68 by 137 feet and will cost about $90,000.

SAN PEDRO, CAL.—Petitions are being signed for the installation of ornamental street lights on Sixth Street between Beacon and Pacific Avenues. The plans call for a lamp every 120 feet and four lamps at each street intersection.

SAN RAFAEL, CAL.—The Pacific Gas & Electric Company has purchased a site at Fourth and E Streets for the erection of a one-story reinforced concrete office building, to cost about $24,000.

SEAL BEACH, CAL.—The Trustees have signed a contract with the Southern California Edison Company for the installation of a complete city electric-lighting system.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,719. ELECTRICAL SUPPLIES.—A commercial agent of the Bureau writes that a business man from Spain is now in the United States for the purpose of establishing commercial relations with American manufacturers of electrical supplies. Catalogs should be sent immediately. Correspondence may be in English but is perferred in Spanish.

NO. 20,740. ELECTRIC AUTOMOBILES.—An American consular officer in Norway reports that a firm in his district is in the market for 100 electric pleasure and 200 electric commercial automobiles. Quotations f. o. b. New York and catalog should be sent. It is stated that cash will be paid against documents. Correspondence may be in English.

NO. 20,738. TELEPHONE EQUIPMENT.—An American consular officer in Venezuela reports that a man in his district desires to receive catalogues and price lists from American manufacturers of equipment for a small telephone system. Correspondence and literature should be in Spanish, if possible.

NO. 20,753. PAY TELEPHONES.—An American consular officer in Peru reports that a man in his district desires to be placed in touch with American manufacturers of slot telephones for the Peruvian 5 and 10-centavo piece.

New Incorporations

NEWPORT NEWS, VA.—Radcliffe Electric Company. Capital, $15,000. Incorporators: W. H. Radcliffe and W. L. Cooke.

CHICAGO, ILL.—Fleer Electric & Manufacturing Company. Capital, $10,000. Incorporators: E. A. Fleer, C. A. Woolley and T. W. David.

JOHNSON CITY, TENN.—Tennessee Electrical Supply Company of Washington County. Capital, $10,000. Incorporators: J. W. Ring, T. A. Cox and others.

TALLAHASSEE, FLA.—Dixie Supply Company. Capital, $5,000. Deal in electrical supplies, automobiles and accessories. Incorporators: B. W. Brown and others.

JACKSONVILLE, FLA.—Florida Electric Supply Company. Capital, $150,000. Manufacture electrical apparatus and supplies. Incorporators: G. C. Henry, Lake Jones and N. C. Overton.

ST. LOUIS, MO.—Semi-Automatic Transmitter Company. Capital, $5,000. Manufacture semi-automatic transmitters. Incorporators: J. H. Mueller, E. H. Springmeier and C. G. Eck.

ROCHESTER, N. Y.—Smith Lighting Company. Capital, $15,000. Install lighting systems. Incorporators: A. W. Chaddock, 45 Enterprise Street; W. F. Smith and L. F. Mignona, Rochester.

PORTLAND, ME.—Choctaw Power & Light Company. Capital, $1,250,000. Construct and operate railways. Incorporators: S. I. Gould, C. H. Tolman, J. T. Fagin and S. D. Rumery, of Portland, and E. L. Jones, of Gorham.

NEW YORK, N. Y.—Auto Electric Service Company. Capital, $5,000. Manufacture electrical apparatus for automobiles, etc. Incorporators: George Strasser, 426 West Fifty-seventh Street; W. C. Wolf and Henry Berlinghof, New York City.

Financial Notes

The Newburyport (Mass.) Gas & Electric Company has asked the Gas and Electric Light Commission's approval of an issue of 570 shares of stock at $130 per share.

The statement of the Jeffersonville (Ind.) Water, Light & Power Company shows that gross earnings of the company last year were $35,942.30, and net earnings $13,508.82. The company's capital, $150,000, is paid up and there are outstanding $112,500 of first-mortgage bonds.

The California Railroad Commission has denied the application of the Pacific Gas & Electric Company, San Francisco, Cal., for authority to issue $1,021,100 par value of common stock. The company applied for permission to issue additional common stock to refund its sinking fund payments for all of this year and part of 1915.

The Youngstown & Niles Railway Company has applied to the Ohio Public Utilities Commission for authority to issue $100,500 common stock to reimburse the Mahoning & Shenango Railway & Light Company, a subsidiary of the Republic Railway & Light Company, for financing the electric railway line the former company is building between Warren and Youngstown. The Mahoning & Shenango Railway & Light has advanced $60,000 and is willing to advance $40,000 additional to purchase right of way between Youngstown and Niles.

Northern States Power Company, of Minnesota, has sold to a syndicate composed of H. M. Byllesby & Company, the Guaranty Trust Company, William P. Bonbright & Company, and Spencer Trask & Company, $8,000,000 10-year six-per-cent notes which are being offered at 99 and interest. The company also has sold to the same syndicate for a later offering $18,000,000 25-year five-per-cent first and refunding bonds. Proceeds of the notes and bonds will be used to provide for the payment of $7,210,000 Consumers' Power, Minnesota, 20-year five-per-cent bonds and $1,434,500 six-per-cent collateral-lien notes of the same company called for payment May 1, and $5,000,000 Northern States Power six-per-cent notes and $3,000,000 Minneapolis General Electric six-per-cent notes called for June 1, and for other refunding obligations, with $2,000,000 of the proceeds for general corporate purposes and requirements of operated properties. The indenture of the notes provides for a permanent noteholders' committee to act for the noteholders during the life of the notes. Lewis B. Franklin is to become a director of Northern States Power and he with W. C. Lane will be two members of the note committee. The issue of the note and bonds is part of the plan for bringing about a simplification of the financial and operating organization of the Northern States Power Company and its subsidiaries which is expected to result in many economies in operating and financing of the corporation and its affiliated companies. The Guaranty Trust Company and associates announce that the $8,000,000 ten-year six-per-cent notes of the Northern States Power Company of Minnesota, have all been sold.

Dividends.

	Term	Rate	Payable
Cape Breton El., com.	Q	$1.50	May 1
Cape Breton El., pf.	S	$3	May 1
Col. Ry., Pw. & Lt.	Q	1.25%	May 1
Col. Ry., Pw. & Lt., pf. B	Q	1.25%	May 1
Com. Pw., Ry. & Lt., com.	Q	1 %	May 1
Com. Pw., Rv. & Lt., pf.	Q	1.5 %	May 1
El. Bond & Sh., com.	Q	2 %	Apr. 15
El. Bond & Sh., pf.	Q	1.5 %	Apr. 15
Havana El. Ry., Lt. & Pw.	S	$3	May 13

Reports of Earnings.

PHILADELPHIA ELECTRIC.

At the annual meeting of Philadelphia Electric Company, retiring directors were

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 17	April 10
American Tel. & Tel. (New York)	128	128
Commonwealth Edison (Chicago)	141	144
Edison Electric Illuminating (Boston)	236	239
Electric Storage Battery common (Philadelphia)	—	61¾
Electric Storage Battery preferred (Philadelphia)	—	61¾
General Electric (New York)	165	165½
Kings County Electric (New York)	130	129
Massachusetts Electric common (Boston)	6¾	6¾
Massachusetts Electric preferred (Boston)	35	35
National Carbon common (Chicago)	—	—
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	134½	136
Philadelphia Electric (Philadelphia)	28	27¾
Postal Telegraph and Cables common (New York)	78	79¼
Postal Telegraph and Cables preferred (New York)	68	68
Western Union (New York)	90	90
Westinghouse common (New York)	62½	69¾
Westinghouse preferred (New York)	70	74

re-elected. Philadelphia Electric Company reports income account for fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$8,777,924	$8,160,025
Total income	2,414,550	1,978,979
Dividends	1,574,311	1,574,311
Surplus	840,239	404,670
Total surplus	2,311,986	1,471,747

UNITED RAILWAYS, BALTIMORE.

United Railways & Electric, of Baltimore, reports income account for fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$9,028,144	$9,293,839
Net	4,885,445	4,891,400
Total income	4,893,778	4,916,121
Fixed charges, taxes, rentals, etc	3,056,832	3,030,327
Discount on securities	37,950	37,950
Interest on income bonds and dividends on preferred stock	560,000	560,000
Dividends on common	818,448	818,448
Surplus	410,548	469,395

In both 1914 and 1915, the surplus after dividends was carried to the credit of depreciation reserve, this amount in 1915 being 4.55 per cent of gross earnings. The profit and loss surplus of the company, December 31, 1915, was 1,008,058, there having been added in the year sundry credits of $4,270.

WESTERN UNION TELEGRAPH.

Comparative earnings report for the three months ending March 31, the month of March, 1916, being estimated, is as follows:

	1916	1915
Total revenues	$14,390,372	$11,568,175
Maintenance repairs and reserved for depreciation	1,863,477	1,776,642
Other operating expenses, including rent of leased lines and taxes	8,870,305	7,618,070
Total expenses	10,733,782	9,394,712
Balance	3,656,590	2,173,463
Deduct interest on bonded debt	332,963	334,300
Net income	3,323,627	1,839,163

AMERICAN TELEPHONE & TELEGRAPH.

Comparative earnings report for the three months ending March 31 is as follows:

	1916	1915
Dividends	$6,619,568.58	$6,306,103.50
Interest and other revenue from associated companies	3,380,850.18	3,445,001.28
Telephone traffc (net)*	2,141,482.13	1,570,773.48
Other sources	450,207.91	272,615.68
Total earnings	12,592,108.80	11,594,494.04
Expenses	1,338,871.00	1,317,798.18
Net earnings	11,253,237.80	10,276,695.86
Deduct interest	1,758,005.13	1,876,605.69
Dividends paid	7,653,970.29	6,968,759.99
Balance	1,841,262.38	1,431,330.18

*One month estimated.

BELL TELEPHONE SYSTEM IN THE UNITED STATES.

Earnings report for two months ending February 29 of the American Telephone & Telegraph Company and Associated Holding and Operating Companies in the United States, not including connected independent or sub-licensee companies. All duplications, including interest, dividends and other payments to American Telephone & Telegraph Company by Associated Holding and Operating Companies, are excluded.

	1916	1915
Gross earnings	$42,012,644	$37,732,290
Operation	14,632,105	13,453,436
Current maintenance	4,950,532	4,635,587
Depreciation	7,736,230	7,094,523
Taxes	2,354,021	2,164,067
Total expenses	29,672,888	27,347,613
Net earnings	12,339,756	10,384,667
Deduct interest	3,122,313	3,196,216
Balance net profits	9,217,443	7,188,451
Deduct dividends (estimated for two months)	5,718,490	5,200,139
Surplus earnings	3,498,953	1,988,312

UNITED GAS & ELECTRIC.

Consolidated earnings of subsidiary companies of United Gas & Electric Corporation for fiscal year ended December 31, 1915, compare as follows:

	1915	1914
Gross	$13,564,410	$13,129,132
Operating expenses, including maintenance	6,836,119	6,912,293
Net income	6,728,291	6,216,839
Taxes	821,428	761,050
Gross corporate income	5,906,863	5,455,788
Fixed charges	3,419,897	3,344,298
Balance available for renewal finances and dividends	2,486,966	2,111,490

STANDARD GAS & ELECTRIC.

Standard Gas & Electric Company reports for the fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross of subsidiaries	$15 539,281	$14,354,689
Net after taxes	7,585,602	6,741,234

Income account of Standard Gas & Electric compares as follows:

	1915	1914
Gross income	$1,618,467	$1,475,029
Net after expenses	1,575,441	1,435,418
Surplus after charges	742,377	619,964
Preferred dividends	471,398	785,663
Balance	270,979	*165,699

*Deficit.

WISCONSIN EDISON, INC.
(North American Company Subsidiary.)

	1916	Per Cent Gain over 1915
February gross of subsid.	$ 827,103	18.33
Expenses and taxes	463,236	5.63
Net earnings	363,806	39.88
Bal. available for dep.	225,330	86.88
Twelve months' gross of subsid.	8,884,100	3.10
Expenses and taxes	5,226,860	2.22
Net earnings	3,657,240	4.39
Bal. available for dep.	2,025,788	7.93

Appropriation for depreciation of subsidiaries for twelve months ended February 29, 1916, was $904,213, an increase of 5.43 per cent over that for the preceding twelve months.

NORTHERN STATES POWER.

Northern States Power Company reports for the twelve months ended February 29, 1916:

	1916	1915
Gross earnings	$5,307,438	$4,507,040
Net after taxes	2,966,760	2,454,620
Interest charges	1,517,994	1,383,650
Preferred dividends	587.524	587,069
Surplus	861,241	483,900

Proposals

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9545, Brooklyn, N. Y., 5,500 feet of telephone cable, 2,000 feet of single-conductor wire; Boston, Mass., 8,000 feet of rat-tail wire for aerials; Portsmouth, N. H., 6,400 feet of galvanized steel conduit. Schedule 9552, Norfolk, Va., five 0.5-kilowatt radio motor-generators, 5 starter panels and seven 2-kilowatt radio transformers. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

MOTORS AND ACCESSORIES.—Sealed proposals will be received at Room 710, City Hall, Chicago, Ill., until April 25, for furnishing and delivering all motors and accessories required for dryer houses Nos. 4 and 5 and the new extractor building at the municipal reduction plant, located at Thirty-ninth and Iron Streets, according to plans and specifications on file in the office of the Department of Health. John Dill Robertson, Commissioner of Health.

ELECTRICALLY DRIVEN PUMPS.—Sealed proposals will be received by the clerk of the City Commission of Middletown, O., until May 1 for furnishing two electrically driven centrifugal pumps with a capacity of 2,100 gallons per minute, and one steam pump with a capacity of 3,000,000 gallons per day.

ELECTRIC-DISTRIBUTING SYSTEM.—Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 20, 1916, for furnishing and installing an electric-distributing system at the Naval Hospital, Washington, D. C. Plans and specifications may be obtained on application to the Bureau of Yards and Docks.

New Publications

ELECTROTYPING SOLUTION.—Bureau of Standards, Scientific Paper No. 275, entitled "Relation Between Composition and Density of Aqueous Solotions of Copper Sulphate and Sulphuric Acid," tells how to determine the composition of electrotyping bathes, which usually contain only copper sulphate and sulphuric acid.

CUSTOMS TARIFFS OF VENEZUELA.—A report of 53 pages, devoted to the customs tariff of Venezuela has just been issued by the Bureau of Foreign and Domestic Commerce, of the Department of Commerce. The purpose of the publication is not only to enable the American manufacturer and exporter to ascertain the rates of duty levied in Venezuela on various products, but also to call his attention to certain aspects of the tariff that may enable him to compete more successfully in that market, by making certain changes in his products, so as to bring them under a lower tariff classification. The rates of duty are given, both in Venezuelan currency and in United States money, inclusive of surtaxes.

Electrical Patents Issued April 11, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,178,497. Electric Regulation. J. L. Creveling, assignor to Safty Car Heating & Lighting Co. of New Jersey. Voltage regulation of dynamo and battery car-lighting system.

1,178,501. Electrolytic Cell. H. M. DuBois, Detroit, Mich., assignor to Pennsylvania Mfg. Co. Special arrangement of electrode and diaphragm.

1,178,503. Fire-Alarm-Box Protector. J. F. Eder, Baltimore, Md. Key has prepared surface registering finger prints.

1,178,507. Wireless Signaling. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Current produced by received waves interacts with local magnetic field of different frequency to produce indication.

1,178,510. Electric Igniting Device for Gas-Burners. D. P. Fuller, Denver, Colo. Combination of make-and-break igniter and gas valve.

1,178,511. Protector for Telephones. J. E. Fullmer and E. L. Bullis, Kilbourn, Wis. Electromagnetic grounding device.

1,178,535. Automatic Circuit-Maker and Breaker. B. R. Mulford, Orange, Tex. Special structure of rotary contactor.

1,178,537. Illuminating Appliance. O. A. Mygatt, assignor to Holophane Glass Co., New York, N. Y. Comprises spaced outer diffusing reflector and inner open-mouthed, prismatic reflector. (See cut, next page.)

1,178,538. Spark-Plug. L. Rose, New Orleans, La. Has adjustable central electrode and chamber accessible to gases of explosion with special provision for keeping products of combustion, etc., off face of insulator.

1,178,539. Insulator. F. Schaub, Jersey City, N. J. Reversible cleat.

1,178,542. Electrica' Gas Lamp. F. Skaupy, assignor to Deutsche Gasgluehlicht Aktiengesellschaft, Berlin, Germany. Special passage between cathode and light chambers in sealed bulb having light chamber filled with a rare gas.

1,178,561. Key-Socket. B. C. Webster, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. Details for lamp socket.

1,178,576. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. of New Jersey. Voltage regulation of dynamo and battery car-lighting system.

1,178,584. Circuit-Controller. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Lubrication of contact reciprocating over stationary contacts.

1,178,587. Method of Making Insulating Joints. F. E. Layman, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Insulation molded about connecting members and joint enclosed in gripping and reinforcing shell. (See cut, next page.)

1,178,591. Electrolytic Cell. F. J. Metzger, New York, N. Y., assignor of one-third to H. T. Beans and one-third to M. C. Whitaker, New York, N. Y. Has diaphragm of birchwood with ends of grain presented to electrolyte.

1,178,596. Governing Device. P. Okey, Columbus, O. Has number of centrifugal governing elements automatically operable at different speeds.

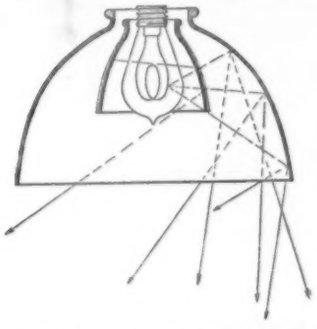
1,178,680. Pneumatic-Tire-Protecting Magnet. D. Rosenthal, Boston, Mass. Electromagnet picks up tacks, etc., in front of wheel.

1,178,703. Pneumatically Operated Electrical Switch. J. F. Bentz and J. A. Sertl, Schenectady, N. Y. Cylinder with hand-operated piston has ends connected with ends of cylinder having piston carrying switch contact.

1,178,713. Protective Apparatus for Electrical Instruments. J. T. Green, assignor to the National Electric Specialty Co., Toledo, O. Arrangement of fused clips and arrester.

1,178,718. Means for Mounting Electric Generators and the Like on Motor Vehicles. E. A. Haslieb, assignor to North East Electric Co., Rochester, N. Y. Cross bar on front ends of springs supports machine in front of automobile radiator.

1,178,719. Electric Signaling Device. J. Hildebrand, Yonkers, N. Y. When device is disturbed so as to dislocate ball holding switch open, alarm circuit is closed.



No. 1,178,537.—Illuminating Appliance.

1,178,732. Barber Pole. W. F. Koken, assignor to Koken Barber Supply Co., St. Louis, Mo. Is in transparent housing and electrically lighted and driven.

1,178,733. Barber Chair. W. F. Koken, assignor to Koken Barber Supply Co. Electrically operated pump controls fluid operating chair stem.

1,178,742. Signal Lamp. C. Mawer, Bucyrus, O. Structure of reflector and casing for headlight projection.

1,178,753. Direct-Service One-Point-Control Dumb-Waiter. H. Rowntree and B. Rowntree, assignors to Burdette-Rowntree Mfg. Co., Kenilworth, Ill. Apparatus at controlling station automatically starts car and stops it at desired floor, car returning to station on closing of landing door.

1,178,771. Rotor for Dynamoelectric Machines. A. Zehrung and R. Rundenberg, assignors to Siemens-Schuckertwerke, G. M. B. H., Berlin, Germany. Arrangement of ventilating ducts.

1,178,772. Electrical Measuring Instrument. J. G. Zimmerman, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Current recorder controlled by differential coils.

1,178,777. Electrical Heating Device. P. F. Apfel, Seattle, Wash. Rod-like unit for heating water by immersion in receptacle.

1,178,792. Electrical Switch. L. W. Flack, Toledo, O. Pull switch.

1,178,797. Metal Punching Mechanism. J. K. Graham and G. Rasmussen, Roanoke, Va. Electrical selective control of punches by pattern.

1,178,822. Electrically Driven Vehicle. R. Schlaepfer, assignor to Busch-Sulzer Bros.-Diegel Engine Co., St. Louis, Mo. Car with electrical internal-combustion engine drive.

1,178,873. Direction Signal for Automobiles. E. Potter, Rochester, N. Y. Control of electrical head and tail-lights.

1,178,878. Telegraphy and Telephony by Submarine Cables, Long-Distance Overhead Lines and the Like. J. Schiessler, Baden, Austria-Hungary. Apparatus for relaying currents.

1,178,879. Electromagnetic Typewriter. J. Schnyder, Kriens, Switzerland. Operation of the various parts by a single electromagnetically operated bar controlled by key circuits.

1,178,882. Electrical Receiving Apparatus. T. N. Slocum, Aberdeen, Wash. Diaphragm of telephone receiver connected to rock mirror.

1,178,883. Electric Stove. T. N. Slocum, Aberdeen, Wash. Vertical heater adapted to have articles detachably secured to sides.

1,178,890. Radiotelegraph Station. G. G. Von Arco and A. Lelb, assignors to Gesellschaft Fur Drahtlose Telegraphie, M. B. H., Berlin, Germany. Alternate connection of transmitting and receiving devices with antenna controlled by transmitter key operation.

1,178,905. Intensifier for Spark-Plug. E. F. Cogley, Omaha, Neb. Details of electrodes and casing.

1,178,927. Galvanic Cell. M. L. Kaplan, assignor to Beacon Miniature Electric Co., New York, N. Y. Process of making dense but highly active depolarizer.

1,178,928. Flash-Light. M. L. Kaplan, assignor to Beacon Miniature Electric Co. Details of portable battery device of well known tubular form.

1,178,956. Steam Generator. J. M. Seymour, Newark, N. J. Arrangement of igniter for charges in combustion chamber in boiler shell and in communication with water chamber.

1,178,975. Spark-Plug. J. Z. Tucker and L. W. Markwort, St. Louis, Mo. Structural details.

1,179,009. Method of Producing Malleable and Ductile Bodies of Tungsten or Tungsten Alloys. A. Just, assignor to General Electric Co., Schenectady, N. Y. Metallic tungsten is fused with boron material.

1,179,030. Coil Separator. E. R. Pearson, assignor to General Electric Co., Schenectady, N. Y. Device for separating coils of electrical machine to promote ventilation, etc.

1,179,059. Hanger for Light Reflecting Bowls. E. L. White, assignor to J. A. White Mfg. Co., Brooklyn, N. Y. Detailed structure of arm having lamp-socket receptacle, bowl seat and chain hook.

1,179,107. Thermal Circuit-Breaker. J. M. Johnson, Kansas City, Kans., assignor to United States Automatic Fire Alarm Co. Fuse-plug.

1,179,108. Indicating Switch. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Rotary switch has auxiliary indicating positions for actuator.

1,179,109. Dimmer Switch for Lighting Circuits. W. Kaisling, assignor to Kellogg Switchboard & Supply Co. Compact device comprising resistance and push button operated shunt.

1,179,117. Telephone. E. D. Lowry, Philadelphia, Pa. Arrangement of diaphragms in loud-speaking receiver.

1,179,127. Insulator. H. R. Markel, Columbus, O. Two-part nail-attached knob.

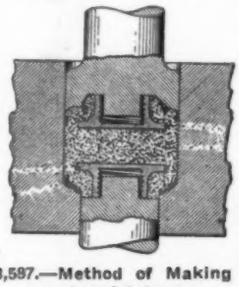
1,179,174. Refillable Cartridge-Fuse. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Details.

1,179,175. Telephone System. E. A. Graham, Brockley, London, England. Special arrangement of transmitter and receiver circuits.

1,179,238. Trolley Wheel. J. W. Swain, Norfolk, Va., assignor of one-half to W. N. Marshall, Norfolk, Va. Structural details.

1,179,239. System for Converting Direct Current into Alternating Currents of Different Frequencies. P. Thalassinos, Philadelphia, Pa. Commutator arrangement.

1,179,260. Automatic Call and Lighting System. R. L. Wood, Jr., and G. E. Crowley, Tallulah Lodge, Ga. For hotels, etc.; drop rings bell and lights lamp.



No. 1,178,597.—Method of Making Insulating Joints.

1,179,276. Fire-Alarm System, Including a Thermal Circuit-Closer. C. S. Bullock, assignor to Bullock Safety Appliance Co., Poughkeepsie, N. Y. Special circuit arrangements.

1,179,293. Selective Relay. F. L. Dodgson, assignor to General Railway Signal Co., Gates, N. Y. Comprises two electromagnets exercising circuit control jointly and independently.

1,179,306. Signaling Apparatus for Vehicles. P. R. Harsh, Toledo, O. Steering-wheel-controlled switch for direction-indicating apparatus.

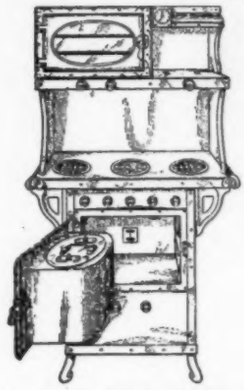
1,179,313. Apparatus for Treating Ores. E. R. Holden, Los Angeles, Cal. Vertical tank having vertically distributed openings; cathode wire connected to copper lining has rotary shaft with plates at different heights and connected to anode wire.

1,179,340. Heating Appliance. L. D. Smith, assignor to Standard Electric Stove Co., Toledo, O. Oven door carries cooker automatically placed in circuit when door closed. (See cut.)

1,179,353. Wireless Telegraphy. L. F. Fuller, assignor to Federal Telegraph Co., San Francisco, Cal. Transmission system comprising an arc.

1,179,354. Auxiliary Alarm System. C. G. Furman, assignor to Gamewell Fire Alarm Telegraph Co., New York. Combination of signal-box mechanism and annunciator.

1,179,373. Electrical System of Distribution. J. W. Jepson, Buffalo, N. Y., assignor to Gould Coupler Co. Dynamo and battery system; voltage regulation by carbon-pile resistance.



No. 1,179,340.—Heating Appliance.

1,179,380. High-Potential Electricity-Arrester. F. R. Parker, Chicago, Ill. Has piece of glass cloth as dielectric member.

Reissue 14,103. Electric-Lamp Socket. G. W. Goodridge, assignor to Bryant Electric Company, Bridgeport, Conn. Original No. 1,121,348, dated December 15, 1914. Relates to securing together of cap and shell.

Reissue 14,104. Motor Control. W. P. Jackson, assignor to General Electric Co., Schenectady, N. Y. Original No. 1,077,717, dated November 4, 1913. Relates to control of series motor.

PATENTS EXPIRED.

The following United States electrical patents expired April 18, 1916:

623,136. Safety Cable System for Electric Railways. H. B. Cox, New York, N. Y.

623,141. Apparatus for Starting Electric Elevators. D. H. Darrin, Cranford, N. J.

623,142. Electric Elevator Switch. D. H. Darrin, Cranford, N. J.

623,172. Junction Box. T. J. Murphy and B. F. Neilson, New York, N. Y.

623,195. Electric Accumulator. A. Werner, London, England.

623,223. Electric-Railway System. W. Stein, Hamburg, Germany.

623,242. Means or Apparatus for Producing and Exhibiting Animated or Changing Pictures on Advertising Appliances, etc. W. Friese-Greene, London, England.

623,275. Electric Letter for Signs. C. A. Chase, Chicago, Ill.

623,279. Arc Lamp. T. E. Drohan, Chicago, Ill.

623,293. Electrically Connected Printing Machine. C. A. Shea, M. and J. J. O'Lalor, Medford, Mass.

623,316. Induction Apparatus. T. B. Kinraide, Boston, Mass.

623,317. Electrical Break. T. B. Kinraide, Boston, Mass.

623,318. Electrical Spark Gap. T. B. Kinraide, Boston, Mass.

623,329. Electric Arc Lamp. A. Mougin, Paris, France.

623,352. Duplex Switch for Telephones. G. C. Buell, Boston, Mass.

623,363. Electric-Light Hanger. W. Gierth and F. Peters, Newark, N. J.

623,323. Motor-Vehicle. F. A. Pocock, Philadelphia, Pa.

623,393. Electric Current Controller. J. B. Breeding, San Antonio, Tex.

623,433. Electric Fan. S. L. Shellenberger, South McAlester, I. T.

623,437. Telephone Switchboard Circuit. E. H. Smythe, Freeport, Ill.

623,441. Automatic Fire and Burglar Alarm. H. E. Thompson, Cameron, N. C.

623,444. Electric Railway Signaling Device. D. Valentine, Brockton, Mass.

623,480. Electric Cigar Lighter. S. F. Kessler, Auburn, Ind.